Promoting Integrity as an Integral Dimension of Excellence in Research

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Investigating the workfloor: experiences of research integrity and misconduct through focus groups

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Executive summary

As part of the PRINTEGER project, researchers asked academic researchers and research support staff across four nations for their views on integrity and misconduct. Academics and support staff identified a range of behaviours as misconduct and questionable research practice, which are detailed in this report. Participants cited institutional structures of academia as key factors affecting research integrity. For example, participants explained how pressure to publish can lead to misconduct or questionable research practice, something that was highlighted in every focus group. Recommendations include changes to the ways in which research output is evaluated, changes to research culture, and training on research integrity.

The central aim of the focus group study was to investigate research integrity and misconduct issues in practice from the perspective of individuals involved in research on the 'workfloor', namely researchers, research managers and support staff. Topics explored included understandings of the definition of integrity and misconduct, participants' experiences of misconduct, pressures in the research environment, the effectiveness of policies, guidance and training on research conduct.

Partners from UK, Norway, Italy and Estonia conducted four focus groups each. All partners worked according to the research protocol developed by the University of Bristol team. Each partner country recruited research support staff and academics from different disciplinary backgrounds and at different levels of seniority. Each research team analysed data from their own focus groups and reported this to the University of Bristol team, which then synthesised the data.

Summary of main outcomes

The focus groups captured views from individuals involved in research in different capacities, across different settings, and with a range of individual characteristics. Variety was found in job type, level of seniority, academic discipline, gender and nationality, though there was little variety across countries. Instead, it was notable that many themes emerged that were common across the focus groups.

Good and bad research

Participants' work in research was motivated by curiosity, enjoyment, and a drive to improve the world. Participants believed that for research to be good, it should be methodologically sound, contribute to knowledge, and be conducted in a positive setting. ***Adhering to proper methods*** was a fundamental part of doing good research to many of the participants. ***Truth*** was valued across disciplines, but recognised as being ontologically different, and methods vary accordingly. It was thought that scientific researchers should have objectivity and disinterestedness in one's results. However, it was recognised that in social science, ***the subjective view of the researcher*** also influences the understanding of data.

Good research was understood to be progressive in terms of adding to existing knowledge or developing new methods or ways of thinking. Participants identified the importance of ***publication and peer discussion*** for furthering knowledge. Central to understanding good research as improvement is that research is ***helpful to wider society*** and responsive to social problems. This ethical aspect distinguishes good research from just furthering knowledge.

Definitions of ***bad research***, poor practices and misconduct were reported in most focus group reports. Participants gave a long list of acts that could be considered misconduct, ***questionable research practices (QRPs)*** or bad research. These included falsification and fabrication, plagiarism, self-plagiarism, salami-slicing, using incorrect methods, misinterpretation of findings, exaggeration,

opportunistic topic selection, publication bias, poor peer reviewing, use of 'dodgy' journals, inaccurate reporting, lack of critical review, misattribution of authorship, and mistreatment of others.

Falsification and fabrication were thought to be examples of extreme misconduct, a view shared by individuals from different participant groups across the countries. It is thought that these practices (and others, such as cherry-picking results, and omitting or manipulating data) arise from the pressure to publish. ***Plagiarism***, like falsification and fabrication, was seen by participants as a form of dishonesty. Plagiarism was viewed as perhaps being more of a problem at undergraduate or masters student level research by some researchers. But it was also highlighted as an increasing problem amongst professional academics by a UK senior researcher.

Self-plagiarism does not involve stealing the work of others but may still be regarded as unfair. The unfairness arises because academics are often judged and rewarded based on the number of publications to their names. Participants did not give this as an explanation for why self-plagiarism was wrong but did identify self-plagiarism as bad practice/ poor research/ misconduct. There was some criticism of researchers who maximise publications in their research by writing lots of overlapping papers (***salami-slicing***), rather than writing fewer, bigger journal articles. Salami-slicing was seen as questionable research practice, but participants stopped short of naming it misconduct.

Not working according to proper methods was identified as bad science by many of the participants in focus groups across all four countries. It was highlighted by some researchers that poor quality work can get through peer review and be published, requiring the scientific community to counter-publish to refute the findings. It was recognised that poor practices, or '***sloppy research'***, were not necessarily misconduct, as they could result from mistakes or a lack of competency.

In scientific research, ***replication*** was identified as particularly important by individuals from across all four countries so that methodological practices that did not support this were highlighted as problematic. The ***interpretation of findings*** was highlighted as an important issue in focus groups across all four countries and participant groups. Interpretation of findings can be superficial and lacking thoroughness due to researchers failing to properly check and replicate their work.

Exaggeration of findings is described as over-selling or hyping one's research findings. It was viewed as a questionable research practice and a form of misrepresenting one's findings. Exaggeration was viewed as problematic because researchers may create grand narratives around their research, over-interpreting the significance of their findings. ***Publication bias*** towards negative findings was identified as a problematic and questionable, stemming from the attitudes of the publishing industry. It has links to the problem of exaggeration, as positive findings are viewed as more desirable, telling a better story than negative results.

Problems with the ***peer review process*** were highlighted by participants. There was a view that peer reviewers can be 'lazy', or that comments made by peer reviewers are not respected by researchers and editors. This can potentially lead to poorer standards of published research. Individuals also expressed concerns about researchers ***failing to take an impartial approach to reviewing literature***, leading to bias.

Problems regarding the accurate and fair attribution of credit for ideas and work was something discussed across the different participant groups. A problem of fake authors or assigning authorship to individuals who have not directly contributed to writing an article was raised as a poor practice. Assigning authorship in this manner is not regarded as a fair reflection of the work that has been done, to either promote an individual or to give more weight to a paper. Inappropriate distribution of credit was viewed as being exacerbated by institutional pressures on researchers to publish or

perceived ideals on author numbers. ***Mistreatment of others*** was discussed and eluded to in many of the focus groups. Much of the discussion regarding mistreatment of others revolved around abuses of power by researchers which were thought to particularly affect junior researchers.

The focus group discussions show that individuals sometimes spoke about misconduct and questionable practices in terms of a ***sliding scale*** where certain acts (such as falsification) were viewed as on the 'extreme end', whereas other issues were viewed as less serious. However, discussions revealed that participants sometimes found it difficult to identify where practices are positioned on the sliding scale because of difficulties in delineating whether a practice is bad research, questionable research practices or misconduct. Disciplinary and cultural differences regarding what constitutes questionable practices or misconduct became apparent in discussions, including some disagreement between individuals on where boundaries should be drawn.

The term '***grey area***' was used when participants discussed practices that were viewed as questionable, or on the fringes of misconduct. Thus, issues such as self-plagiarism and salami-slicing/text recycling, exaggeration, poor research methods and authorship practices tended to be discussed as examples. In the 'grey areas', some individuals grappled with distinguishing when a practice is legitimate and when it crosses a line to become bad practice or misconduct.

Perceived causes of misconduct, QRPs and bad research

In the main, the perceived causes of misconduct, QRPS and bad research was the ***competitive research environment***, quantifying research outputs for evaluation of researchers and institutions for funding and pressures to publish. The academic system was viewed by many participants as being influential to the everyday practices of researchers.

The example raised across the board was the ***pressure to publish***. Plagiarism, self-plagiarism, salami-slicing and text recycling were all viewed as practices that have arisen from the 'publish or perish' culture in research to maximise number of publications from research. Many participants thought that pressure to produce publications could lead to a reduction in the quality of scientific methods, but also self-plagiarism as researchers attempt to maximise publication outputs.

There were fears that the 'publish or perish' culture in academic research posed a ***risk to scientific method***, because in the push to publish some researchers are failing to adhere to strict methods. Another concern was that poorly constructed research, or research conducted with questionable practices such as 'cherry picking' data, can have a detrimental effect on the validity and reliability of the results of research. The problem of ***unreliable findings*** was viewed as a potential consequence of bias for positive findings in academic publishing.

It was expected that bad research being conducted generally does not get published because of the process of peer-review which act to regulate what gets published. However, ***self-regulating processes*** such as peer review are not infallible. There was criticism that peer-review can be unfair or biased towards certain topics, and that research of poor quality or a consequence of misconducts such as falsification or plagiarism can get through the system to become published.

Many participants expressed concern that ***the way that science and research is evaluated is exacerbating pressures*** on researchers to publish, therefore contributing to the increase in questionable research practices such as self-plagiarism, salami-slicing, exaggeration and opportunistic topic selection. However, there was also some discussion that despite the problems with the current evaluation system, there is currently no better method to replace it. Thus, it was thought that to help overcome these problems, academia first needs to devise better systems of evaluation.

The ***role of institutions*** was an aspect of dealing with misconduct or questionable research practices that was raised in some focus groups. It was highlighted that institutions need to be careful in how they deal with misconduct or poor practices that are a consequence of honest mistakes, where researchers may not be aware of their malpractice. In these situations, it was thought that institutions should not be too harsh on researchers.

Defining research integrity

Despite being able to identify a lack of research integrity, and being able to characterise good research, participants had less clarity about ***what research integrity meant***. They associated research integrity with methodological soundness, an adherence to social responsibilities, and being a good person. One researcher emphasised that ***integrity was aspirational*** and that the relevance of integrity for researchers develops and changes over the course of their careers. Many participants thought that research integrity also has ***different meanings or relevance*** for different disciplines due to different methodological best practices.

Research integrity in terms of ***using good methods*** to produce robust, reliable research was highlighted as important to demonstrate the legitimacy of one's research amongst the research community. ***Following institutional rules and procedures*** was perceived as helpful because it introduced consistency and transparency in the planning and oversight of research. ***Openness of data*** was identified as an important issue for researchers because it is becoming increasingly important for funding and publication.

Challenges to research integrity

Participants were readily able to identify several ***challenges to research integrity***, including systemic problems, pressures of the academic work environment, problems with research culture, conflicts of interest and accessibility and translation of policies into practice. These problems were elaborated on in detail.

While some researchers thought that a bit of pressure in the academic environment can be a good thing, it was thought by others that when pressures become too great, people start cutting corners, which is a challenge to research integrity. It was not surprising that ***pressures to publish*** were highlighted across all focus groups and were thought to be a big challenge for research integrity because these pressures were believed to motivate acts of misconduct and QRPs.

Time was another pressure of academic work that raised in many discussions. Some researchers thought that there is not really time to discuss research integrity in their day-to-day work. This means that research integrity is not an issue that is prioritised, even though some researchers found talking about it as part of this research interesting. Time pressures combined with ***workload*** were identified as an issue for academic researchers where they may have teaching and administrative tasks such as obtaining ethical approvals for their research, which can take up valuable research time and can be perceived by researchers as a barrier to them getting on with doing the research:

Time pressures combined with pressures to publish was an issue identified to be particularly challenging because it was thought that they contribute to ***lowering quality research outputs***. Here, researchers are incentivised to publish in large quantities and therefore do not have the time to devote to developing research ideas to their full potential. Moreover, it was thought that the combination of these pressures led to researchers operating according to the rules of the system to publish in large quantities, to the detriment of producing larger, more substantiated pieces of work.

Recommendations

It was evident in discussions about misconduct and poor research practices and about barriers and challenges to research integrity, that the current research system is influential on research integrity. Participants from focus groups conducted in all four countries had suggestions for ways in which the research system could be adapted to help promote integrity. These suggestions mainly focussed on potential changes to research evaluation, research culture and training.

Evaluation of research

In one group it was thought that the ***evaluation scheme*** could be improved if evaluation was more sensitive to disciplinary differences and would ensure that funding is allocated across disciplines. One group discussed the need for a shift towards emphasising quality over quantity in evaluation of researcher outputs. Making ***reward systems and incentives*** compatible with promoting integrity was also discussed in other focus groups. The ***publication system*** was viewed as not necessarily functioning in a manner that promotes integrity and, potentially exploitative of academic researchers. The bias towards publishing positive results and pressures to publish were identified by participants as challenging to research integrity from across all four countries.

Many participants highlighted that ***different disciplines may have different requirements***. In discussions about promoting integrity, there was recognition by some researchers that rules or policies implemented by institutions need to be mindful that there is a 'one-size-fits-all' approach will not work.

Social and cultural issues

There was a view that creating ***a sense of community*** would be beneficial to promoting research integrity in younger generations of scientists/researchers. It was thought that they would feel that they belong in the community and adopt the shared values of the community. A community approach to standards setting could increase discussion amongst researchers regarding what is acceptable in research.

In addition to clear rules, clear and effective ***sanctioning of bad behaviour*** was discussed. Whilst some participants had voiced concerns about the limitations of sanctions as effective and beneficial to promoting research integrity, there was also support of sanctioning.

Whilst the recognition that clear rules, standards and sanctions are a fundamental part research culture that promotes research integrity, there was some discussion regarding potential ***limitations to rules and guidelines***. Participants emphasised that developing a ***positive research culture*** needs to go beyond rules and policy. There was concern that 'top-down' imposition of rules, developed without adequate consultation with researchers could be problematic and unhelpful. It was also highlighted that there should be a focus upon individual responsibilities to ensure research integrity.

Participants in some groups thought that raising awareness and competency in research integrity across different levels was an important aspect of building a ***culture of integrity***. It was thought in one group that awareness about integrity policies and good practices was particularly important for research leaders who could promote this amongst their team and look out for any problems. Senior researchers were viewed as powerful actors with the ability to promote or hinder a culture of integrity.

It was reported that participants in some groups identified having a culture that approaches research with ***openness and transparency*** was important to promote integrity. All groups agreed that integrity should be built into the research culture.

Participants in various groups identified improving researcher's ***work environment*** as important in promoting research integrity. Employment security and pressures of limited funding periods for researchers was raised across various focus groups. ***Dealing with pressures*** of the academic workplace was identified as an important aspect of helping to promote research integrity by participants in several focus groups.

Role models and support

Another element of developing positive research cultures identified in focus groups from all four countries is ***the provision of adequate support*** of researchers by institutions. Leadership in departments was also identified as important as well providing ***role models***.

Mentoring was highlighted as potentially useful for promoting research integrity in students. However, mentoring was also seen as a potential barrier and challenge to research integrity, as some researchers had less contact with their mentor post-PhD. Members of one research governance advisor group discussed how in their work it was helpful to engage with senior and mid-level researchers to act as ***"research integrity champions"*** in their departments. These engaged researchers could support the work of administrative staff responsible for supporting research integrity.

Having ***a specific person*** go to for support and advice about integrity issues was raised in several focus groups. It was thought, that the creation of an official institutional level "ombudsman" to help with arbitration of conflicts between researchers or researchers and collaborators could be a useful addition to support research work.

Some groups spoke about the importance of focussing on research integrity as a ***positive thing***: in terms of promoting good practice, and doing better research, rather than upon negative aspects like misconduct. It was thought that a positive approach which accepted that mistakes in research can happen, is more likely to encourage researchers to come forward for advice and be open and honest if they do make mistakes. Mistakes were viewed as something to learn from and an opportunity to identify and solve research integrity problems.

Training

There were various suggestions made by participants regarding ***training***. In one research manager group, one of the participants thought that if students and researchers are expected to operate according to certain codes of ethics, it is important that they receive adequate training that introduces these codes to them. In discussions about training it was suggested that it would be beneficial to ensure that training is provided to different staff involved in research and at all levels, including more ***senior researchers*** about research integrity.

In addition to thinking about who should receive training, there was discussion about the ***content*** of training. Some senior researchers perceived that there was great value in learning through discussion of 'real life' examples. A form of case/example-based training described by some research governance advisors were "lessons learnt sessions". Here, senior researchers share past mistakes with other researchers in their institution. This approach to training engages researchers and can help to reassure junior researchers that research work is manageable and that mistakes can happen, but that these can also dealt with. Nevertheless, this level of openness, to share mistakes, was not thought to be something that all researchers would feel comfortable in doing.

Whilst case/example-based and face-to-face training were well regarded by participants discussing these styles, a limitation of this type of learning is that they require a lot of ***resources***. Another

limitation of face-to-face sessions at their institution might be that it can be ***difficult to get academics together*** to do training because of their workloads.

In some researcher groups, participants spoke about tools in terms of ***computer-based training*** for researchers about research integrity. It was thought that an "obligatory web course" could be helpful to promote discussions about integrity, and some junior researchers described how they found computer-based training tools offered to them by their institution (regarding data management and confidentiality) helpful. They are quick and simple to use, enabling researchers to work through them in their own time. It was also highlighted that these tools should be developed to accommodate for the training needs of researchers at different levels of seniority.

When asked what researchers need to help promote research integrity, one aspect that UK senior researchers thought about was ***tools that can help them to do good research***. The provision of practical tools to facilitate collaboration between researchers, such as software to assist in document sharing, archiving and project management is particularly helpful for them in their work.

In sum, researchers and research support staff recognise a range of practices that they would class as misconduct or questionable research practice. The most notable pressure on research integrity comes from organisational structures in the workplace itself. Particularly the competitive research environment and the evaluations systems of academic performance were seen as exacerbating the pressures in researchers, which may result in questionable research practices and even misconduct in research. Recommendations include further training, encouraging a positive research culture, and making changes to the way research is evaluated.

Background

This focus group study is part of a wider research project: PRINTEGER (Promoting Integrity as an Integral Dimension of Excellence in Research), funded by European Union's Horizon 2020 research and innovation programme. The mission of PRINTEGER is to enhance research integrity by promoting a research culture in which integrity is part and parcel of what it means to do excellent research, not as an external and restrictive control system.

Aims

The central aim of the focus group study was to investigate research integrity and misconduct issues in practice from the perspective of individuals involved in research on the 'workfloor', namely researchers, research managers and support staff. Among topics explored were understandings of the definition of integrity and misconduct, participants' experiences of misconduct, pressures in the research environment, and the existence and effectiveness of policies, guidance and training on research conduct.

To account for possible cross-national cultural variability, focus groups were run in the countries of four partners: UK, Norway, Estonia, and Italy.

Methods

Overview

Partners from UK, Norway, Italy and Estonia conducted four focus groups each (total number of focus groups: 16). All partners worked according to the research protocol developed by the

University of Bristol team. Each partner was responsible for sampling, recruitment, data collection and initial analysis in their own country. The protocol was granted research ethics approval by the Faculty of Health Sciences Research Ethics Committee at the University of Bristol; and was further approved by research ethics committees at the other three partner institutions.

Participants

Each partner country recruited academics and research support staff. The academic researchers were recruited from different disciplinary backgrounds and at different levels of seniority. The research support staff were university personnel in research management and research support roles.

Sampling

Purposive sampling was used to identify potential participants. This allowed individuals with characteristics relevant to the research questions and aims to be strategically identified (Ritchie et al, 2003). It was not necessary or feasible to aim for a statistically representative sample as this was a small-scale, exploratory, qualitative research project (Ritchie et al, 2003).

Where possible, focus groups were mixed discipline, gender and ethnicity. Each focus group was homogenous in the career level and /or role of participants. The purpose of such composition was to allow exploration of important variations between participants (such as research disciplines) while enabling the researcher to explore issues raised between the different participant groups. A degree of homogeneity may encourage group cohesion. Thus there were four types of focus group: i) junior researchers: early-career researchers (< 5 years post PhD), PhD students, research assistants/associates or equivalent; ii) mid-level seniority researchers: mid-career researchers (5-10 years post PhD or equivalent professional experience), research fellows, assistant professors; iii) senior researchers: professors or readers (research roles where an individual is a principle investigator/management) and iv) research managers and advisors: individuals involved in developing governance policies and supporting researchers.

Eligible individuals were adults with capacity who were working in the relevant job roles that are of interest for this research. Individuals also had to be fluent speakers of the native language of partner institutions conducting the focus groups (English, Norwegian, Italian or Estonian). Exclusion criteria were:

- being employed purely in industry or another non-academic research setting;
- being employed by in institutions outside of those specifically targeted by the partners conducting the focus groups;
- being unwilling to be audio-recorded.

Recruitment

Each research team in the partner countries used the same mixed methods approach to identify potential participants, such as utilising university staff information webpages, institutional contact directories and consultation with department heads or institution/consortium administrators. The research teams then sent invitations and study information sheets to potential participants by email. This was followed up two weeks later with a reminder to those who had not responded. If there was no reply to the reminder email after 7 days, researchers identified new contacts with equivalent demographic characteristics and repeated the invitation procedure.

Data collection

The University of Bristol team conducted a pilot focus group with mid-level seniority researchers to check the effectiveness of the focus group format and questions. Feedback from this pilot was shared

with the other research teams who collaborated to alter the question schedule and plans for the focus groups. Before data collection commenced, it was ensured that all the research teams fully understood the agreed protocol.

Each focus group lasted 1.5-2 hours. Focus groups were conducted in English or the native language of the local research team. Where a language other than English was used, the project documents were translated into that language. At the beginning of each session, participants were given a paper copy of the information sheet and were asked for written informed consent. The question guides followed a format advised by Krueger and Casey (2015): a warm-up question to introduce participants, followed by questions that become increasingly specific, targeting key areas of interest for the research, and ending in closing questions that sum-up and check key points with participants.

The focus groups were audio recorded, and a second member of the research team was present to take fieldnotes. The purpose of the notetaker was to provide a back-up in case the audio recording equipment failed (Krueger & Casey, 2015), but also to gather useful contextual information about the session, such as observations about group dynamics, body language, and reflections about the question route (Finch & Lewis, 2003). The position of the notetaker varied slightly between research teams. In the Estonian focus groups, the notetaker sat separately to the main group to unobtrusively observe the discussion and record notes (Finch & Lewis, 2003). In the Italian and UK focus groups, the notetaker sat as part of the group, but did not get involved in the discussion. In the Norwegian focus groups, the notetaker sat as part of the group and also helped to facilitate the interviewing. The audio-recordings of each focus group were transcribed verbatim in the language spoken in the focus group.

Analysis

Each team independently analysed the data from their own focus groups. This was followed by synthesis of findings by the University of Bristol team. The analysis process ran concurrently with data collection, beginning as soon as the first focus group was complete. Each team used Krueger and Casey's (2015) 'Classic analysis strategy'. This method is a form of constant comparative analysis. It is a systematic framework approach to identify inductive themes in focus group transcripts and categorise findings (Krueger & Casey, 2015).

Each research team wrote a report for their own four focus groups describing an overview of the sessions and detailing the findings of their analysis. A draft of each report was given to the relevant participants providing them with an opportunity to check and comment on the findings from their focus groups. This resulted in some minor changes for some reports (such as removing detail to ensure anonymisation). After each focus group report was finalised, each research team complied an overview report comparing and contrasting the findings between the different participant groups. These reports formed the basis for synthesis of data by the University of Bristol team.

Synthesis

The method used for the synthesis of qualitative data across all the focus groups draws upon seven stage meta-ethnography techniques originally defined by Noblit and Hare (1988) and developed by other researchers. (Morgan et al, 2016; Lee et al. 2015). The following systematic method of synthesis was used:

Stage 1: Getting started and stage 2: Deciding what is relevant to the initial interest
The focus groups were designed to meet the aims and objectives of the project

Stage 3: Reading the studies

All the reports were read through in full so that the researcher became familiar with the findings from all four countries, so that the researcher was familiar with the analysis reports (but not all the original datasets).

Stage 4: Determining how the studies are related
From the outset, the focus groups and reports followed the same design across all the countries and participant groups, and closely related to each other around concepts of research integrity.

Stage 5: Translating the studies into one another
The data were organised in NVivo by grouping together answers to the same questions across the 16 focus groups and stratifying the answers according to participant type (i.e. junior, mid-level and senior researchers and research admin/managers/governance advisors) and country (i.e. Estonia, Norway, Italy and UK). This created a framework of comparable data, enabling an exploration of how the different focus groups related to each other across sub-topics and sub-groups, allowing direct comparison. The interpretive content (written by the reports' authors) of each focus group report was coded, creating second order constructs.

Stage 6: Synthesizing translations
This involved developing themes for the data across all the reports (thus, these were third order constructs that were an interpretation of second order constructs). The reports organised in the framework were then coded in NVivo according to these third order construct themes, which included both the descriptive and interpretive accounts of the authors (second order constructs), but also importantly any direct quotations of participants included in reports (first order constructs).

Stage 7: Expressing the synthesis
This involved describing the themes developed in the synthesis according to each question category. Here, similarities and differences between findings from different focus groups were described using the first order constructs (participant verbatim quotations) as evidence. In the main body of this report, 'theme' is used to denote a third order construct. Some relevant literature has been referred to in order to provide context, but this should not be taken as a full narrative of the wider situation.

First order constructs	Verbatim participant quotations
Second order constructs	Interpretation by researchers (authors of reports)
Third order constructs	Interpretation of second order constructs

Table: Explanation of first, second and third order constructs.

RESULTS

1. Motivations for doing research (questions posed to researchers only)

Overview

Participants' motivations for doing research were curiosity, enjoyment, improvement of the world, circumstantial routes to becoming a researcher and the unquestionable pursuit of a scientific/research career. These results are similar to those found by the Nuffield Council on Bioethics, which reported main motivations as 1. Improving the researcher's knowledge and understanding; making scientific discoveries for the benefit of society and, satisfying the researcher's curiosity (Nuffield Council on Bioethics, 2014). Disciplinary differences were not measured in the PRINTEGER focus groups, but Nuffield found that "Respondents working in medical research are more likely to cite 'making scientific discoveries for the benefit of society' as their main motivation. 'Satisfying my curiosity' is particularly important for respondents working within computing and physics." (Nuffield Council on Bioethics, 2014, p30). A researcher's daily work often includes more than pure research, and participants also mentioned enjoying non-research aspects of their work, in particular teaching. Teaching opportunities are known to be one of the motivations for entering academia. (Kolokythas and Miloro, 2016; Sheaffer et al., 2008; Straus et al., 2006; and Garrison, 2005)

1.1 Curiosity

In all seven focus groups who reported on motivations, curiosity was raised as a drive for conducting research. Researchers explained how curiosity and a yearning to learn and understand the world or a particular discipline or topic, drove them to pursue their interest at university, continue on into postgraduate studies, or into a career in research. Given the nature of academic research work, it is perhaps not surprising that the inquisitiveness recognised as a motivator in education (Berlyne, 1960; Rossing, 1981) is also seen in academics. Other studies have also shown that an interest in research topics provides motivation to pursue an academic pathway (Trindade et al., 2012), and there is evidence that curiosity is linked to positive workplace performance. (Reio and Wiswell, 2000)

- Curiosity.

- Yes, I think, also curiosity.

- At first curiosity…

Estonia mid-seniority researchers

…it was just fascinating. I made my first aquarium when I was seven, then my parents were shocked when the dog died, then I was very interested in cutting up the dog and see what is inside… I knew that I will study biology in first or second grade… What is inside the dog, still interests me.

Estonia senior researchers

I like finding things out, and I basically discovered it doesn't entirely matter [what]. I did for my PhD what I thought I was interested in and I was and now I don't work anywhere near that, but I still get to find things out which is cool. UK Junior researcher

I have a question that I want to answer. I work in the (sciences) so it's very easy to justify for people to give me money because it's about diseases and the disease I work on is cancer and I'm really interested why cancer happens in the first place, that's what drives me…

UK mid-level researcher

I would say for me it's largely curiosity driven. It's kind of wanting to know more about the world in a very broad sense because in fact in topics like computer science you don't necessarily deal with the world as it is, but you could also deal with the world as it could have been or might be or might become. So that's my motivation.

UK senior researcher

1.2 Enjoyment

Enjoyment was another motivation expressed by researchers in four of the seven groups. Researchers enjoyed the variety and challenges in their work. For example, the Italian report described how a junior researcher liked facing new problems each day and working with PhD candidates and students. However, enjoyment was not reported as a motivation for doing research in any of the senior researcher groups.

> *I guess I just find it good fun. I'm a statistician and I just really love computer programming. It's like, you know, learning a whole new language and, yeah, it's like a- it's kind of like doing a puzzle or something like that and putting all the pieces together and then they all have to go together in the right way for it to work.*
>
> *UK junior researchers*

UK mid-level researchers:

> *…of course I enjoy being an academic…*

Enjoyment also seems to be closely linked to curiosity, as participants report pleasure in being able to follow their interests and problem-solve in their work:

> *I am here because I like the field of study I am engaged with. I went to the university to study it, and then I thought that I wanted to do that for as long as possible… now I am working within this field. Very good, everything is great. My hobby is my job.*
>
> *Estonia junior researcher*

> *…ultimately, it's because it's fun and it's because it's interesting. The cures for cancer are some way off in my work, its more about actually saying well we are trying to understand something very, very fundamental about chemical reactions and how we can make molecules do what we want them to do. It's good fun.*
>
> *Mid-level researcher*

1.3 Improvement

A drive to improve of the world we live in, or to make things better, was a motivation for doing research only expressed in the UK focus groups, at all levels of seniority. Here, participants described how scientific research could make a positive impact on the world:

> *…can we stop it [cancer], can we prevent it as much as possible because I've seen patients that have cancers and I've seen their life with chemotherapy and it's not life worth living as far as they're concerned so I think the best way is to stop it getting there in the first place for future generations, and that's what drives me every day, to come back, do things, find things.*
>
> *UK mid-level researcher*

> *I genuinely think that science is an opportunity for us to make the world a better place and my motivation is simply that by doing better science I can make other people's lives less miserable, let's start by setting the bar quite low, happier, safer.*
>
> *UK senior researcher*

Participants from arts and humanities fields also described how their work could also contribute to making things better:

> *Perhaps finding out stuff about areas that haven't been- there's not much known about particularly for the reason it might not have been considered important or (inaudible) in the past but people are now thinking they are more important so- just getting other people to think differently about issues and not just about your own personal curiosity…*
>
> *UK junior researcher*

> *It would be nice to think by doing so [research work] that I would make some people's lives less miserable but I make some people's more miserable… if I really wanted to do that there are better ways of doing it than by doing philosophy but on the other hand I think that the more philosophy there is in the world than it is a better place both intrinsically and in terms of effects on other people…*
>
> *UK senior researcher*

However, one UK junior researcher was sceptical regarding the extent to which his research would actually improve the world, labelling his motivation for improvement as *"very pie in the sky".*

1.4 Circumstantial routes to becoming a researcher

Participants in five focus groups, including researchers from each country and level of seniority, described how doing research was motivated in part by a series of circumstances or opportunities that led them to their current role. Where expressed, this motivation was often underpinned by individuals' curiosity:

> *For me… on the one hand, it was a coincidence of many chances, but now when I look back at it later, somehow the chances coincided or the or the choices were made in such a way that I always had the interest in the intellectual issues or problems, and this took me forward.*
>
> *Estonia junior researcher*

> *I knew after high school, or before that I will become a doctor. I did not think yet that I might become a scientist. I did not think I will be a lecturer. I am three persons in one. All, I have kept clinical practice, I teach and do research. But this became as a coincidence of different circumstances… I stayed home with children after getting my profession, I was home for a long time, I had time to think what I still want to know more, and my husband started his PhD studies, and then I… I have always interested in why something is as it is and the time that I was away, brought clarity.*

Estonia senior researcher

Another individual in the Estonian junior researchers group described pursuing research due to a perceived lack of other options:

> *I did not have anything better to do. After the Master's studies I had no other options… now you apply for PhD studies, and I applied.*
>
> *Estonian junior researcher*

Similarly, as described in the Italian reports, two participants from the Italian junior researcher group had had no initial plans to go into research, but circumstances led to them to do it and they subsequently realised that they enjoyed it. This sense of simply following a path one is already on was shared by a UK junior researcher too:

> *And it's sort of just a career in a way that also you've sort of gone into so in a sense it's your trajectory. Sometimes you keep going- (group laughter) it's less sort of idealistic.*
>
> *UK junior researcher*

1.5 Unquestionable pursuit of a scientific/research career

In two focus groups, individuals described how their pursuit of a career in research was unquestionable. One of the Italian junior researchers felt he *"had a calling"* to enter research. This is a recognised category of motivation for entering an occupation, and there is evidence that those with a 'calling' enjoy better health. (Wrzesniewski et al. 1979). In Estonia, two senior researchers described how research was a family tradition and an expectation of theirs from an early age:

> *- Family. My father and his brother and two sisters all studied biology and my grandmother was a pharmacist, and there was no other, it was just fascinating.*
>
> *- I am also a scientist by heritage, only my parents were physicists, but it goes over generations, my grandfather was a pedagogical scientist, so I could not imagine another occupation than a scientist, absolutely. But I wanted to be a physicist as a child, but I became a linguist.*
>
> *Estonia senior researchers*

Summary:

Most researchers appear to be motivated by curiosity although other factors such as enjoyment or favourable circumstances play a role in their career choice. However, for some research is viewed as an unquestionable career path to take. In the UK, some researchers across all levels of seniority describe being motivated by wanting to improve the world, health or contribute to developing knowledge, although there was some scepticism regarding the extent to which this happens. In all but the senior researcher groups, enjoyment and fun was expressed by participants as a rationale for doing research.

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2. Defining good research

Overview

Participants defined good research in terms of methodology, contribution to knowledge (innovation and improvement), and the environment in which it is conducted. Good research has been similarly defined elsewhere as rigorous, accurate, original, honest and transparent (Nuffield, 2014, p19). When discussing 'good' research, participants refer to a combination of ethically good characteristics (bringing about improvement) and traits relating to the quality (methodology). This corresponds with philosophical ideas about the inseparable relationship between science and ethics and, is very similar to notions of research integrity (see section 4 of report); that scientific rigour and ethical conduct are each necessary but not sufficient for integrity in research. Dawson and Yentis (2007) argue that sound methodology is essential for ethically good research because poorly conducted research can be harmful to participants, deprives society of potentially useful developments, is a waste of resources, and may bring research into disrepute. One of the implications of the relationship between good science and ethical research is that research ethics committees' remit should include assessment of methodological rigour (Dawson and Yentis, 2007). Subsection 'Outcomes of misconduct' below describes participants' views on the issue of damage to the reputation of science.

2.1 Proper methods

Research done according to proper methods was discussed in all but one of the focus groups who reported on the topic of good research. Adhering to 'proper' methods was seemingly a fundamental part of doing good research to many of the participants. Discussions were not in-depth technical discussions of methods, probably due to disciplinary heterogeneity within focus groups. However, variation in what good methods entails between individuals was apparent. For example, one mid-level seniority researcher from Italy thought that good methods in research meant strictly adhering to standard methods:

> *[Good research is] a research that applies very strictly the available methodologies [the definition of good research] is not based on purposes or similar factors; a well done research is a research that applies very strictly the standard methods shared by the scientific community.*
>
> *Italian mid-level researcher*

Another researcher from this focus group proposed that good research can break away from standard, accepted methods to innovate new ways of doing research. Indeed, some participants thought that innovation was an important aspect of good research as described in the innovation theme below.

> *[In certain fields, it is sometimes important to] break the existing balances and try new methods of research… the standard method accepted by journals is not necessarily the best one.*
>
> *Italian mid-level researcher*

Furthermore, it was highlighted in the UK senior researcher focus group that what constitutes methodologically good research can vary according to different epistemological approaches adopted. Nevertheless, within different research communities there exist certain standards one must adhere to:

> *…we all belong to very distinct epistemic communities who have very particular ideas about what constitutes quality and that's largely driven by the people at the top of our profession at any one time. I'm sure it's the same for you guys as well. (other participants agree)*
>
> *UK senior researcher*

It was also recognised that best practices change over time as new methods and tools for research develop, and that keeping up-to-date with best practice is also an important part of doing research work:

> *…the target of good practice or best practice is constantly evolving, especially as tools become available online that we didn't have before, so I guess one of the things that we try to do is we try to keep each other updated on where best practice is…*
>
> *UK senior researcher*

The ontological assumptions of disciplines underpin ideas of proper methods. This was demonstrated in focus groups where there was a mix of researchers from science and humanities or arts disciplines. Truth was valued across disciplines, but recognised as being ontologically different, and methods vary accordingly:

> *I think science as an intellectual process has to be subjected to the search of truth and this is my first principle and if it is not subjected to it then there is no point in discussing further.*
>
> *Estonian senior researcher*

> *What do I consider good research? The whole point is to try to discover something that is true, somehow […] Integrity must be measured by this standard. That is, by how true the results are, or how truth-seeking one tried to be.*
>
> *Norway junior researcher*

> *[Truth in humanities subjects is] openness and impartial approach, that you are open to all results, whatever they are.*
>
> *Estonian senior researcher*

> *I suppose in the arts it's not necessarily about truth exactly in like we're doing kind of a reading of a novel or something … It's kind of the reading that's convincing and it convinces other people and perhaps is thought provoking and can create other research work or other approaches it so it kind of challenges other people's work and its relevant to other people so that would be … good research.*

UK junior researcher

However, the reality of finding out 'the truth' was also recognised as problematic by some researchers because methodological limitations in science can mean that findings are not necessarily able to reach the truth:

> *For me I guess it's about trying to get as close as possible to the truth as you can and there may be many reasons why you don't get that close to the truth in that, you know, I don't know, there might be like a data entry error or the person who's doing the questionnaire like misunderstands a question or something like that so there will be loads of reasons why some of the data you might have might not exactly be a perfect representation of reality.*
>
> *UK junior researcher*

Thus, placing an emphasis on utilising the most appropriate methods, but also highlighting that it is important for good research, that researchers are critically aware of the limitations of their work in terms of reaching truth:

> *I think for me it's … getting as close to the truth as possible because I think that was initially something I considered very important but I think right now I'm personally more interested in coming up- the research that I'm involved in is coming up with a model that works for whatever we're trying to achieve but maybe I'm a bit cynical but I don't really believe anymore that any of these models actually (inaudible) the truth, but they have a function and one of the important functions I think is that it allows us to be critical and interrogate whatever's happening around us. That to me is quite an important aspect.*
>
> *UK junior researcher*

The importance of truth searching in scientific research perhaps explains why certain issues were identified as important to proper methods in scientific research. Replicability was discussed in several focus groups where it was highlighted as a key part of good scientific research:

> *Good science is replicable science*
>
> *Estonian research administrator*

Researchers explained that good practices enabling others to replicate findings or work out what is different was important:

> *Well-kept lab books where I can go back to the lab book and repeat the same experiment.*
>
> *Yes, I was going to say repeatability, but chemistry often doesn't quite repeat and then it's also sometimes good research to figure out what's different…*

UK mid-level researchers

Indeed, one UK senior researcher highlighted how best practices have developed to try to help deal with problems with replicability:

> *…on the reproducibility crisis… if you want to be recognised as an effective statistician, [we now aspire] to make both the data and the script file that you use to generate all your results publicly available, as in our example Python [lab notebook software]. So that's part of the process of [journal] submission. When your paper comes out the data is archived, and the script file is archived, and anyone can reproduce all of your results just like that.*

UK senior researcher

Another aspect of best practices or methods in science highlighted by researchers in the UK senior researcher focus group is that it is important to ask the right questions in research (which could take time to develop properly):

> *…for me good science … starts with asking the right questions and then trying to follow it up and come up with reasonable answers… what I try to teach my students is about, you know, don't settle too quickly for a question because, you know, how to do it or there's maybe bigger questions to be answered.*

UK senior researcher

Moreover, methods should provide findings adequate to answer your research questions, but also researchers should interpret these properly:

> *… [you need] answers that provide you with the right kind of knowledge and understanding but there are ones that have been properly justified in the evidence or argument.*

UK senior researcher

Interpretation of findings was also discussed by two Estonian groups as an important aspect of doing good research. It was thought that scientific researchers should have objectivity and disinterestedness in one's results, as shown in this exchange:

> *- For me, it would be the scientific method, and its continuous and relentless observation, you cannot do without it. The best conducted science is the one that hangs on to the scientific method… Scientific method in the most general wording is that we have a hypothesis, we have the control of hypothesis and the conclusions based on that… and is not the case when a person tries as hard as possible to verify the hypothesis, even if the evidence is starting to prove the opposite.*
>
> *- I agree 100%.*

Estonian mid-level researchers

Estonian junior researchers identified differences between natural sciences and social sciences research in terms of subjectivity. Transparency was thought to be particularly important for social sciences because the 'subjective worldview' of the individual researcher could influence the design of experimental work:

> *Well, in social sciences it is very important, we come back to the same [question of] replicability… true, how the natural scientists agree between each other the principle of justice, this is purely between the people themselves. But in the case of social sciences, this is extremely important, because the results in social science are less or more, whether we want it or not, the question of belief and [related to the] worldview of the authors. And even if the experiment was maybe conducted in a neutral way, but what kind of experiment was conducted in the first place can be a reflection of the so-called subjective worldview, and in order to repeat this or understand where this result came, it is in fact very important that all those who, in one way or another, were involved, also those who might have argued against it… well, in that case the displaying of authors and showing their contribution as transparently as possible is very important.*
>
> *Estonian junior researcher*

The subjective view also influences the understanding of data. In contrast to social sciences, it was thought that interpretation of data in the natural sciences was more straight forward and less vulnerable to researcher's subjectivities. One participant explained how social sciences sometimes incorrectly attempt to adopt methods from natural sciences:

> *When we speak purely about the natural sciences, there is no question of belief. You have very concrete data and results here, and what you yourself believe in or do not believe, it not an issue… in social science… mostly it is the question of belief, or the belief in the understanding of certain definition, these are measurable, weighable things, so here it is what you yourself believe in, what you could believe and what other fellow social scientists believe in. This has to be delineated very precisely in the results not to create questions of belief for those who read it, that either you tell here something that you believe, or you want us to believe, in a word, it becomes very complicated. And yet, the third, most obscure realm is when a social scientific study, which is based on belief, seeks to be fortified through bringing in seemingly methods from natural sciences. They take some two-three things that are in fact not measurable, and study them by seemingly natural scientific methods, these are measured, experimented with and finally, to give the final touch of plausibility, the [results] are published with great exactness, up to decimal points, as is becoming for a natural scientist. But this does not really add a lot of credibility to the thing, because of these issues of belief...*
>
> *Estonian junior researcher*

In several focus groups, there were discussions about different methodological needs of researchers. Importantly, it was highlighted that truth can have a different relevance or can be understood differently in non-scientific research:

I think science as an intellectual process has to be subjected to the search of truth and this is my first principle and if it is not subjected to it then there is no point in discussing further. As we understand truth in different disciplines.

Estonian senior researcher

[what is or isn't good research] may be partially different depending on the discipline

Italian junior researcher

In non-scientific disciplines, proper methods are not those that aim to search for objective truth. Researchers from humanities or arts fields highlighted several things that are important for doing proper methods within non-scientific disciplines. One junior researcher in the UK thought research should be convincing or challenging to stimulate new ways of thinking:

I suppose in the arts it's not necessarily about truth exactly in like we're doing kind of a reading of a novel or something we're just- I guess it's kind of the reading that's convincing and it convinces other people and perhaps is thought provoking and can create other research work or other approaches it so it kind of challenges other people's work and its relevant to other people so that would be kind of good research.

UK junior researcher

Furthermore, openness, honesty and critical awareness of one's work was highlighted as an important aspect of proper methods of work in non-scientific research. The following exchange demonstrates an overlap in what constitutes good research across disciplines:

- [Truth in humanities subjects is] openness and impartial approach, that you are open to all results, whatever they are.

- Correctness of presenting results.

Estonian senior researchers

2.2 Furthering knowledge

Good research was understood to be progressive in terms of adding to existing knowledge or developing new methods or ways of thinking. Thus, good research was described as research that could contribute to knowledge development and learning, answering longstanding questions and keeping things moving forward:

- Development, there has to be a component of development, that it takes us further, not stuck where we are.

- Learning.

Estonian research administrators

[Good research is] an original research that increases the level of knowing of the entire academic community

Italian junior researcher

[Being a good researcher means to do research with] the aim of increasing knowledge

Italian senior researcher

…answering longstanding questions is another aspect [of good research] …

UK mid-level researcher

There were two approaches to how research can be novel: either by apply appropriate methods agreed by the research community, or by breaking methodological boundaries and introduces novel ways of doing research:

[Good research is] probably a research that brings something new, by using, of course, the scientific method.

Italian senior researcher

[It is sometimes important to] break the existing balances and try new methods of research…the standard method accepted by journals is not necessarily the best one.

Italian mid-level researcher

The importance of originality was shared by other participants in UK focus groups, in terms of exploring new topics or methods, or looking at different ways to think about things:

[Good research is] something that's novel and interesting basically.

UK junior researcher

…another aspect I would say, often you find different ways of thinking about a problem and then it's a challenge to actually join, sometimes, you know, there are ways to join this kind of different ways of thinking, this is another important aspect which is a bit underestimated but it's also I would say good research as well.

UK mid-level researcher

Participants identified the importance of publication and peer discussion as processes for furthering knowledge. In the mid-level researcher group, publishing research (including negative results) was viewed as an important part of communicating and developing knowledge. In the junior researcher groups there was concern that the 'publish or perish' culture could be detrimental to disseminating research because many papers published may be of poor quality or contribute little to developing scientific knowledge. However, one participant thought that contributing small achievements, even of incomplete research, was important to developing knowledge:

> *[instead of publishing a] well meditated and completed [research, it is important] to understand that everyone could add a small brick; if all these small bricks were coherent, you could build a wonderful house; on the contrary, if someone adds a brick, a big but empty brick, the building will not stand up.*
>
> *Italian junior researcher*

Discussion and challenge amongst peers was identified as important to furthering knowledge. A UK mid-level researcher thought that revealing ideas to colleagues for discussion and opening them up to challenge was helpful for researchers developing their ideas. However, she also highlighted that researchers need a suitable environment for this to occur:

> *…it's challenging yourself as a researcher by actually exposing it to your colleagues and undergoing scrutiny isn't it? Not just in terms of peer review but also in terms of discussing ideas and developing them further and the risk there very much is if you're not in a good environment and you pretty much work on your own then that process of challenge isn't happening.*
>
> *UK mid-level researcher*

2.3 Improvement

Participants in several focus groups from all the countries regarded good research as research conducted with the aim to bring about improvement. There appears to be some overlap with the theme of furthering knowledge, in that both themes are about development. However, what distinguishes improvement from furthering knowledge is the ethical aspect, as it has a specific focus on being useful to society. This idea of good research seemed to be very important to some participants, while others regarded research as independent work that sought the truth, irrespective of the demands of society at a particular time.

Central to understanding good research as improvement is that research is helpful to wider society and responsive to social problems:

> *Not only is it [good research] supposed to be true, but it is also supposed to have significance. Useful.*
>
> *Norway junior researcher*

> *[good research should be] useful to the society.*
>
> *Italian mid-level researcher*

> *…there is one more aspect [to good research], openness to the surrounding society or cultural space, the willingness for dialogue, the willingness to respond to problems that somehow arise, or, willingness to be in the discussion with other scientific disciplines, or even with other directions in the society, be it politicians or whoever.*
>
> *Estonia mid-level researcher*

Moreover, one of the UK senior researchers expanded this idea further stating that research should not only be *useful* by addressing important social concerns, but also presented in a way that is *useable* to make it more likely that research is *used*:

> *…coming from my perspective about science being a vehicle basically is that the science we do has to be- its, you know, it's something like (pause), there's three U's… Useful, useable and used... That's the catch phrase so when you think about the science you do you ask, you know, in terms of what I want to achieve with my science, is the science I'm doing useful, am I packaging it in a way that's useable and can I actually see that the people are responding to what I'm doing and using it.*

UK senior researcher

Finally, the notion of improvement as indicative of good science was also described as an addition to other aspects of good research such as good methods or furthering knowledge. For example, a member of the UK junior researcher group thought that research should be interesting, but that it is also important for research to have an application:

> *…I feel like to an extent there has to be some sort of use for it at the end, you know. As fascinating as it can be to, you know, look into any question at all, I think if you get really into something you'll find it interesting, but I feel like if there's some sort of application at the end of it that is pretty important.*

UK junior researcher

Indeed, one Italian mid-level researcher thought that to get published, research must go beyond good methods, to also be socially relevant (although it is not clear from the report whether they thought this was a good thing or not):

> *[to get published, research needs] a strong impact on industry, economic policy or on some research field.*

Italian mid-level researcher

There was some criticism about defining good research in terms of improvement expressed by individuals. For example, in the Estonian junior researcher group some members thought that good science should not be responsive to society but should instead rise above and distance itself. Estonian junior researchers had the following exchange:

> *- good science is such that does not meet the immediate needs or address some instant demands, but in a word, addresses some everlasting ...*
>
> *- Well, truth.*

Estonian junior researchers

However, this idea was disputed by other members of the group, who argued that good science should be socially relevant and useful:

> *is that good science, that is being done in a figurative ivory tower, that the scientist does not have to relate or interact with society, or is this good science, which still somehow responds to the needs of society?*

Estonian junior researcher

Furthermore, in the Italian mid-level researcher group, one participant thought that research utility should not be conflated with research quality. Arguing that theoretically innovative studies that have no apparent benefits to society can be good research too:[1]

> *I know many papers of high quality [...] perhaps they deal with phenomena of small importance, phenomena that rarely happen or have no consequences of great impact on society; I would say that these are not useful as studies but they may be of high quality.*

Italian mid-level researcher

There was also uncertainty about which topics should be deemed important:

> *I have many doubts about which research topics are important.*

Italian mid-level researcher

2.4 Positive research setting

Several researchers thought that a positive work environment was important for good research. In terms of good research, this was described in two ways. First, in Estonia, when defining good research, one senior researcher regarded social aspects of the research environment as important, such that people should be treated well in their work:

> *I would say that I can say better what are things that should be avoided at the first instant. First, in science as intellectual process what should be avoided is that a lie is published. And in the second is the social aspect that good people are not treated badly.*

Estonian senior researcher

Second, it was thought that good research was linked to supportive work practices. As already mentioned, open discussion and peer challenge were thought to encourage originality in research. As the quotation below illustrates, the professionalism and established work standards of the research team were also deemed to be influential on good research:

> *One goes into a lab, takes measurements; some measures, some data are different from what he expected or from what his group leader did expect, so he deletes that data. In physics, this is terribly improper, you do not do it, but someone might do it and these things happen. Then, if in a lab there is a whiff of this and there is a defence mechanism, then the new student who has done it is discouraged [from doing it again], the next student is discouraged, etcetera. If,*

[1] However, the idea that theoretically innovative research with no apparent use can be good research was disputed by one of the UK senior researchers when discussing bad research (see next section – 3)

instead, there is not this defence mechanism that practice spreads out to the whole environment.

Italian senior researcher

Summary

Proper methods were the dominant theme across all groups that discussed good research. But furthering knowledge, improvement, and research setting were also important factors for researchers. Despite not being cited as a personal motivation for doing research in countries other than the UK, improvement was highlighted by researchers across all four countries as being a component in 'good research'.

Only senior and mid-level researchers reported the research setting as being important for good research, but this was not reported amongst the junior level researchers. However, issues around research culture are raised by junior participants in relation to challenges to research integrity and promoting research integrity, indicating its importance to this participant group too in terms of the overall discussions.

There was no apparent variation between researchers of different countries or levels of seniority, differences appear to be individual or disciplinary differences (there was little data on this topic from the Norwegian group).

3 Defining bad research, poor practices and misconduct

Overview

Definitions bad research, poor practices and misconduct were reported in most focus group reports apart from the Norwegian junior and senior researchers and research administrator/ manager/ governance staff groups. Participants gave a long list of acts that could be considered misconduct, questionable research practices (QRPs) or bad research. These included falsification and fabrication, plagiarism, self-plagiarism, salami-slicing, using incorrect methods, misinterpretation of findings, exaggeration, opportunistic topic selection, publication bias, poor peer reviewing, use of 'dodgy' journals, inaccurate reporting, lack of critical review, misattribution of authorship, and mistreatment of others. Some of these practices have been identified elsewhere. For example, PhD students and researchers identified the following unethical behaviours in research: "increasing research "waste," non-publication of negative results, authorship manipulation, data manipulation, and repression of collaborators." (Buljan et al., 2018). Similarly, 18-34% of PhD students in another study had heard of cases of plagiarism, falsification or fabrication of data, or plagiarised publications within the past year. (Jensen et al. 2018) Junior and senior researchers in Malaysia had witnessed data manipulation, misrepresentation of research outcomes, plagiarism, authorship disputes, breaching of research protocols, and unethical research management (Olesen et al 2018).

Some practices were considered more serious than others. This seemed to relate negatively with notions of good research, so that serious misconduct was that which violated the central aims of research (for example falsification defies the aim of discovering the truth), while practices that did not affect the validity of research itself (such as self-plagiarism and salami-slicing) were considered dubious, but not misconduct as such. Participants regarded the researcher's intentions as morally

relevant and, had sympathy for people acting under pressure. Participants identified various possible causes of misconduct and poor practice, most commonly the pressure to publish.

3.1 Identified misconduct/Questionable Research Practices (QRPs)/bad research

In line with the interview questioning, participants in all the reporting focus groups attempted to identify things that they thought were misconduct, QRPs or bad research. Many things were highlighted by participants, however, there was not always agreement regarding whether something could be classified as misconduct or not (see the sliding scale theme below).

A few participants in research administrator/manager/governance advisor focus groups explicitly stated that research misconduct, QRPs and bad research covered a wide range of issues:

> *There are so many; from data fabrication to the improper use of authorship mechanisms, nepotism in peer review process...all the things we all know.*
>
> *Italian research manager*

> *It could be a very long list. … serious ones obviously plagiarism, fabrication and falsification and they seem to be in pretty much every institution's policy, but there's a lot of grey areas that may or may not be; things such as bad authorship practices, so giving people authorship when they haven't made a substantial contribution is quite a big one, just mismanagement of data, but to be honest it can be anything where you haven't been fully transparent to be honest, and so it's, yeah, it's absolutely huge. Not to declare conflicts of interest as well I would say is poor practice.*
>
> *UK research governance advisor*

Falsification and fabrication

As the UK research governance advisor highlights above, falsification and fabrication were thought to be examples of extreme misconduct, a view shared by individuals from different participant groups across the countries. It is thought that these practices (and others, such as cherry-picking results, and omitting or manipulating data) arise from the pressure to publish. (Nuffield Council on Bioethics, 2014, p29-30) Falsification and fabrication were identified as serious misconduct, and unlike some of the other issues discussed (see below), this classification was not disputed by other participants. This may be because falsification and fabrication were viewed as dishonest actions and therefore, believed to be clear examples of misconduct by participants and also perhaps because fabrication and falsification go against the most fundamental value of scientific discovery, namely seeking truth. As Meriste *et al*. put it, fabrication and falsification "eat at the core of what science is all about, they replace truth with fiction, and thereby also impede the inquiries of other researchers who rely on the relevant work." (Meriste et al., 2016, p15)

> *In the worst side are clear fabrication.*
>
> *Estonian senior researcher*

In extreme cases it [bad science] is fabrication of data, usage of untrue information…

Norwegian mid-level researcher

-I think the worst one is making up data. That would be…

-It does happen.

UK mid-level researchers

Participants from some of the junior researcher focus groups thought that misconduct in the form of falsification or fabrication are uncommon and did not report direct experience of these misconducts:

Personally, I do not know anybody who would write [i.e. fabricate] numbers. Who does not measure, but writes. In a word, falsifies results, all the time purely falsifies something.

Estonian junior researcher

- I guess it probably doesn't happen very often but I'd say the worst thing would have to be outright lying-

- Yeah, really manipulating your data…

UK junior researchers

However, some participants from senior researcher focus groups did know of incidents of falsification/fabrication. This difference perhaps stems from the senior researcher's greater experience and time working in research:

Though in the field of biomedicine there was a precedent when a well-recognised person was caught, not with a falsification but with dishonest collection of data. This can also be a falsification. And this was a big scandal… A well-known professor was personally in charge [of the project].

Estonian senior researcher

…the misconduct thing, that's of course a whole raft of other things that would be publishing stuff that you know is wrong or not carried by your experiment or manipulating your data or stealing other people's work and I've seen all of these cases- cases happen…

UK senior researcher

Plagiarism:

Plagiarism, the copying of another person's work without due acknowledgement, is arguably dishonest and unfair (Meriste et al., 2016). Plagiarism, like falsification and fabrication, was seen by participants as a form of dishonesty (to the point of being compared with a 'crook'), but fairness was not mentioned.

> *[Misconduct are things that] Like affects us, plagiarism or stuff that's kind of dishonest in some way.*
>
> UK junior researcher:

> *One thing that we surely also have, where there are no plus and minus sides, is plagiarism. Often how people treat it, for some it is where you just take long paragraphs and publish it under your own name, or then many who have been caught, I have seen such things, that have also been written about…you take some published data, present them in a different way, write more or less the same there and get your name on an article, such things happen. And the other, more complicated case is if it is more like an essay, a person reads a piece and rewrites it under their own name and says, now it is my work.*
>
> *Estonian senior researcher*

Plagiarism as a misconduct shared across disciplines, including arts and humanities, where misconducts relating to data manipulation were viewed as less relevant:

> *…the most obvious one [misconduct in the humanities] would be plagiarism and because it's difficult to think of many other examples… because there isn't really anything quite equivalent to your misreporting of data… There are some cases oddly enough where actually there is such thing, that's true, all the experimental philosophy where these things could occur, but I think plagiarism is the most obvious one…*
>
> *UK senior researcher*

Plagiarism was thought to be uncommon in one comment reported in the Estonian research administrator focus group:

> *Even those true cases of plagiarism, if we look around in the world… I have read about one or two cases which I know have been brought out and told that the person misused resources and wrote things they should not have, but there are not that many cases, in my opinion these are quite rare.*
>
> *Estonian research administrator:*

However, plagiarism was viewed as a common by other participants:

> *… The biggest concern for me is that plagiarism is very common…*
>
> *Estonian mid-level researcher*

Indeed, plagiarism was viewed as perhaps being more of a problem at undergraduate or masters student level research by some researchers in UK, Italian and Estonian focus groups:

> Still, in general, I have not encountered any knowledgeable [cases of plagiarism] in my life, only on the BA level. The plagiarism occurs during the first, second year, the essays taken from the Internet, these happen rarely, but happen. I have unfortunately never expelled anyone, I have given an F, but at a more mature age, if a person is a scientist, s/he will have some kind of perception of the world. If s/he wants to be a crook, she can become an estate agent. Will earn more.
>
> *Estonian mid-level researcher:*

But it was also highlighted as an increasing problem amongst professional academics by a UK senior researcher, who explained how plagiarism detection software originally used in student submissions was also now used to check submissions to academic journals:

> *…so, we've gone through this development first with the students and we realised painfully that actually ok, this is not happening once or twice, this is becoming systemic and now this same process has entered the academic publishing world because it simply happens too often that people take other people's work.*
>
> *UK senior researcher*

Self-plagiarism

Unlike plagiarism, self-plagiarism does not involve stealing the work of others but may still be regarded as unfair. Self-plagiarism is the act of replicating one's own work. The unfairness arises because academics are often judged and rewarded based on the number of publications to their names. Participants did not give this as an explanation for why self-plagiarism was wrong but did identify self-plagiarism as bad practice/ poor research/ misconduct. Self-plagiarism was raised in Estonian and Italian focus groups, but not reported in the UK or mentioned in the Norwegian report. Self-plagiarism was thought to be an important issue by some:

> *I think it is very important, and even… I am an editor, self-plagiarism or just a plagiarism – that is an important topic, yes. It is sad, but that is the truth, it's a fact.*
>
> *Estonian mid-level researcher*

Salami-slicing research

Another practice raised by several participants in Italian, UK and Estonian focus groups which has some overlap with self-plagiarism, is salami-slicing research: writing multiple papers from one piece of research. There was some criticism of researchers who maximise publications in their research by writing lots of overlapping papers, rather than writing fewer, bigger journal articles. Participants thought salami-slicing was questionable research practice but stopped short of naming it misconduct:

> *…there is a lot of research that has to do with academia becoming an industry, sort of people turning the handle on this is what gets you promotions and this will get you that, so it's sort of salami sliced research. You have one good idea and then, you know, what's the absolute paper that you can publish on that idea. You see a lot of that as well but that's maybe not- none of that is misconduct in a narrow sense, it's just not my cup of tea, it's not why I think that I'm here at university…*
>
> *UK senior researcher*

> *I have not met this personally… but what has been mentioned several times… the pumping out of the idea as many publications as possible, this can be seen, not only in [University name], but I have seen such contexts where it has been taken bit by bit and made several formats of the same work…. I saw it from the title and the abstract that it is a kind of scooping of ideas and squeezing out the last drop in order to get some kind of minimum number.*
>
> *Estonian research administrator*

Salami slicing research was viewed as problematic by one individual because of the informational noise it creates, making it harder for researchers and other users of research to pick out the most important messages from the abundance of publications available:

> *…But now we are starting to talk about how society has a lot of informational noise. If the scientists produce a lot of informational noise that they know beforehand could have been worded not as a 10-page article but as a paragraph in a larger, more thorough article, then we are going down the slippery slope of producing informational noise, that could be defined as misconduct. That what is not useful for society and that exhausts the society.*
>
> *Estonian mid-level researcher*

Incorrect scientific or research methods

Poor methods: data collection and analysis

Not working according to proper methods was identified as bad science by many of the participants in focus groups across all four countries.

Bad science is to not act in accordance with research ethical rules, and philosophy of science and relevant methodologies.

Norwegian mid-level researcher

Where it [research] gets bad in my opinion is if the goal to produce 1.1 publications gives rise to giving in on the scientific method… And another issue arises when a scientific experiment is conducted in a fashion where the quality of the experiment does not really meet the purpose.

Estonian mid-level researcher

It was highlighted by some researchers that poor quality work can get through peer review and be published, requiring the scientific community to counter-publish to refute the findings. This demonstrates how individuals both perceived academic research is self-regulating, but also that this process is not infallible, the fact that poor quality research gets through peer review, to be published, is also problematic:

- How much we find total trash in scientific literature. I come upon, like some last ten years I have every year, or every other year specifically published an article that directly refutes a falsification or a work that just did not apply controls. Look, if we add this elementary thing, the whole thing is just a technical artefact.

- Absolutely

Estonian senior researchers

The problem with sloppiness in research, affecting the veracity of research outcomes was highlighted in focus groups as poor research, but it was recognised that poor practices were not necessarily misconduct, they may often result from mistakes or a lack of competency on behalf of researchers:

…then there are all kinds of random mistakes that can be reduced. And then there is grey area, for example, you do not execute controls.

Estonian senior researcher

In many ways the biggest danger can happen when you give someone a job to do and they do it, but they didn't necessarily know how to do it that well, so part of your project might have been done and as far as they're concerned they've done it perfectly, but they haven't.

UK junior researcher

In scientific research, replication was identified as particularly important by individuals from across all four countries so that methodological practices that did not support this were highlighted as problematic. Indeed, poor record keeping and lack of replication before disseminating findings was

explicitly discussed as bad research in the UK mid-level researcher focus group. Where particularly in complex research, attention to methodological rigour were viewed as important:

> *and then there is not keeping proper records of experiments of research and not replicating the data enough before publication or even in seminars…*
>
> *UK mid-level researcher*

> *…so, I mean have you actually- have you reproduced enough times to actually show that specific result, and this is not just experimental data because you're getting more and more into theoretical models because they're becoming very complex now, you know, just showing one trajectory with specific model is that enough, no of course it's not enough really…*
>
> *UK mid-level researcher*

This idea of non-scientific research being conducted and passed-off as science was raised by Estonian junior researchers who spoke about poor methods of data collection in surveys constructed by individuals outside of academia, with examples of individuals working in journalism or politics provided:

> *…there's a very big difference what kind of process this question results from. If you have some meeting in a newsroom or at the head office of a party, or somebody is having drinks on a boat in the evening, and they think they want to know of something, let's make a question and publish it. This is not the same as what is created somewhere in a research group after months of work, where all the different wordings are discussed and so on and so forth. That is not comparable.*
>
> *Estonian junior researcher*

Interpretation of findings:

The way in which researchers interpret their findings was highlighted as an important issue in focus groups across all four countries and different participant groups. In the Estonian research administrator group, concerns were voiced that interpretation of findings can be superficial and lacking thoroughness due to researchers failing to properly check and replicate their work:

> *What has become increasingly popular, is the emergence of science with quite arbitrary interpretation of results… The results in the article did not correspond to real results, which were displayed on the graphs… Certain overheating occurred in the discipline, where every small result was published in a high-level journal, which was often quite free of substance.*
>
> *What is missing?*
>
> *Replicability.*
>
> *Estonian research administrator*

In other focus groups there were concerns about researchers 'cherry picking' or manipulating their data to make it align with preconceived ideas. It was thought that there is a risk that research can be ideologically driven, where researchers may lack objectivity in their interpretation of findings and development of research questions which can lead to bias. Conducting research in this manner was certainly viewed as dubious, resulting in poor quality research, but also cherry-picking one's data is seemingly easy to do, perhaps with intention:

> *the entire scientific activity is eventually an attempt, at best, to verify or falsify hypotheses, so the difficulty is to distinguish between a sound scientific hypothesis and an ideology*
>
> *Italian research manager*

> *In medicine there is a situation that belongs to the same field, the question of honesty or not making wrong decision, seeing the big picture, it is seeing intentionally wrong picture, which I think is related today to the fact that we have so much data. Big data, as they say. That if you have, for example the data for the whole Estonian population, 1.3 million and you can check for anything, and link with all databases, then it is obvious that with such big data you can get coincidences, relations that in reality… if you purposefully look and want to prove something, you will get it.*
>
> *Estonian senior researcher*

> *[If] I had an idea on my mind while designing the experiment and if some data do not add up, it is easy to throw them away.*
>
> *Italian senior researcher*

Poor practices such as poor interpretation of findings can be a consequence of researchers lacking competency and needing more training to conduct and interpret their work correctly:

> *This is often lack of education, people do not understand that this is some kind of, that this is doing wrong, if you do your false positive frequency… You cannot write an article [stating] that I found so many correlations with such significance, and not talk in which cases you did not [find] and how much you actually sought. This is something we try to bring more into education…*
>
> *Estonian senior researcher*

But also intentional acts that veer towards misconduct

> *I have had a concrete case with a colleague, where another colleague, [who is] now at a very high position at the university, comes to him and asks: "What do you think, how many data point I could leave out, consider them outliers? … The more the better, it would better correspond to my theoretical conception." For me, this is a clear malpractice.*

Estonian senior researcher

Exaggeration

Exaggeration of findings is closely linked to the above discussion about data interpretation. Researchers described exaggeration as over-selling or hyping one's research findings. Exaggeration seemed to be an important issue and was identified focus groups from across all participant groups and countries. It was viewed as a questionable research practice and a form of misrepresenting one's findings. Exaggeration was viewed as problematic because researchers may create grand narratives around their research, potentially over-interpreting the significance of their findings. However, it was suggested that research with a 'big story' does well, despite the inflation:

> *[It is poor practice to misrepresent findings]: to sell a balloon as a hot air balloon*
>
> Italian junior *researcher*

> *In my science it seems that… when speaking not only about oneself but also about the work of others, that the works that are doing the best, are the works and results and articles where the story is actually much larger than the data itself, where perhaps a fantasy element is added and a big story is created that gets tremendous resonance.*
>
> *Estonian mid-level researcher*

As well as creating 'grand narratives', inflating one's work was also viewed as something that may be exploited by researchers to increase the likelihood of their work being published so that they can increase their impact factor:

> *If one, in order to have his paper published, says that he has discovered how to cure something, the hazard can sometimes be positive, sometimes it is pathological instead, and it only serves to increase the citation index or for the career.*
>
> *Italian senior researcher*

Exaggeration to get a big media response to one's work was discussed in the Italian research manager focus group, where it was viewed as bordering on deception:

> *overinflating [results], [means that] you sell what you do not have [particularly to local or international press]*
>
> *Italian research manager*

Moreover, there was also some concern that work that over exaggerated findings could be based upon poor methodological practices that do not realise or communicate the limitations of one's findings:

> *Stuff that kind of, I don't know, oversells itself as, you know, the biggest, most cutting edge thing and* actually it might be based on really quite weak statistics or something or they've used statistics in so*me way to make something seem like it's really 100% very convincing but actually behind it there's maybe very limited data and all those things you were saying about like where the uncertainties and the errors had come in they've just totally ignored that, and then somehow sold it as something very important.*
>
> UK junior researcher

However, one of the mid-level Estonian researchers thought that exaggeration of research is a risk when researchers present their work to non-academic audiences. This implies the researchers need to exercise caution in translating their work for other audiences:

> *…it is probably inevitable even when you explain it to someone else in the field, or if you explain it to a grant board or to the press. We cannot just use the same metalanguage we would otherwise use by default. We have to translate a bit, to embellish a bit, make some adjustments, but based on our competence, our reading, our knowledge, I think that each of us probably understands that here is the line, if we cross that, then it is rubbish. That it is no longer the same thing, there is some kind of distortion, which means that people do not understand it properly. And at that moment you react, if the journalist misunderstands then you have to go and say, hey, you got it wrong, this is bad.*
>
> *Estonian mid-level researcher*

Opportunistic topic selection:

The issue of researchers selecting topics for research on the basis that they are 'mainstream' or popular according to current trends in research was raised in Estonian focus groups. There was also some mention of this in terms of editorial decisions in the UK mid-researcher focus group (see below). Here, there was some criticism of research that designed to target funding rather than topics that researchers have a real interest in:

> *I would not necessarily say that top science is, good science, I think that perhaps, on the contrary, top science may be bad science, because in science it is the same way that there are fashion trends that come and go, and often that which at one moment is top science, is some kind of fashion trend that gets stuck and which may not go any further and there would be a need to go change the direction. And then, if you are doing science only by directing yourself towards what is at this the moment… the mainstream which is stuck, then you're producing something that will not get you anywhere.*

Estonian junior researcher

- In my opinion this goes with the Ancient Greek principle that moderation is the best. It means that some moderate intellectual pressure to research things that interest the world, that is reasonable. But if you follow only that where you can publish something in fashion then you lose what you could really give to science. And that is very bad in my eyes.

-I totally agree. I have faced this dilemma to get funding, I have been forced to think about it, ok, let's do this because this is something that will get me money. But under that cover I can also do what really interests me… I am also not very satisfied and sometimes I have to motivate my staff a lot to take part, to do this, despite that the project seems quite meaningless to us.

Estonian senior researchers

Publication issues

Several issues relating to publication processes were identified by individuals as problematic, affecting the quality of research that is published in academic journals.

Publication bias:

The bias towards publishing negative findings was identified as a problematic and questionable practice stemming from the attitudes of academic publishing industry. Here there are some links to the problem of exaggeration, in that positive findings are viewed as more desirable because they tell a better story than negative results. This issue was raised by individuals from different participant groups in UK and Estonian focus groups:

In the natural sciences there is a collision between the pressure to publishing and the so-called grey areas in terms of, as the results… if the hypothesis is, statistically speaking, sufficiently good, it finds statistical confirmation after the experiment, and then the positive result is publishable. But if an experiment was carried out, but the result was not obtained, it is more difficult to publish a negative result.

Estonian junior researcher

A lesser thing that we come across very, very frequently is that people- there is no interest, no drive to report things that didn't work and things that didn't work are sometimes really important to know about, but to them [publishers]… It's not an interesting journal publication or anything like that, so in some ways that's also poor science, and that's quite a challenging area to then get information, 'cos it would be useful to know we've tried that modification and it didn't work. But the publishing drive is very much well tell us about the cool stuff, don't tell us about the hundred experiments you did before then.

UK mid-level researcher

As well as positive results, Estonian senior researchers also highlighted that publishers may also want researchers to tell uncomplicated and "*simple, glossy stories*" (senior researcher) when reporting their research, avoiding ambiguity and messiness. This was viewed as problematic and damaging to science, because of the pressures this can place on researchers if they want to publish in 'top' journals:

> *…we can see that science is going, in publication, the community pressures us to, one thing is that we do not publish negative results, the other thing is that we do not publish complicated things. If we want something, we want our career to take off, if there are good journals, Nature, Science, Cell, Lancet, and they in general want, there cannot be left an open end … [they want] concrete results…*

Estonia senior researcher

Finally, although highlighting the bias to publishing positive findings, researchers were also aware of some measures being taken by the community to try to resolve this problem:

> *- Some journals have made a very good system… they will take accept your article [for review] that includes everything besides your results, and then they decide whether it will be published or not, and only then you add the results.*
>
> *- Yes, that is one way ... to overcome this.*

Estonian junior researchers

Poor peer review

A few problems with the peer review process were highlighted by participants. In the UK, the mid-level researchers discussed how editors and reviewers may use their power to publish or hold back work according to their own agenda or interests:

> *…you send out articles and then they do get rejected, not based on the science, I mean it's the experience of everybody, it's just based on maybe the interest of that group or that referee not to have that paper out there.*

UK mid-level researcher

> *I'm pretty sure I've had papers rejected with suggestions for lots of extra work and in the meantime two competitors published their own work so it's almost certain that they were the reviewers.*

UK mid-level researcher

In Italy, fake reviewers were identified as a form of misconduct, with the view that this was perhaps quite prevalent:

> *There are many fake reviewers.*

Italian junior researcher

Moreover, there was a view that peer reviewers can be 'lazy', which was identified as contributing to bad research:

> *[in my experience] many reviewers are lazy*
>
> *Italian junior researcher*

However, interestingly, in Estonia, senior researchers highlighted that sometimes comments made by peer reviewers are not respected by researchers and editors, so that the work remains uncorrected. This can increase the work for peer reviewers or at worst, potentially lead to poorer standards of published research:

> *- …one of the most unpleasant experiences has been, that has increased lately, is that you do it, you work hard on it, you make a proper review and the author does not make the changes. And the editor sends [the article] you for second review and then the typical reaction is from me that I worked hard the first time, but second time I got angry, to the point that I have written in capital letters "BAD SCIENCE", not let it through. But this is double work.*
>
> *- Yes, it is so. I am the scientific editor of [a local medical journal] … There are quite many among the authors who do not bother to answer to the reviewers as it is, and I have to intervene. Quite mystical, why it is so.*
>
> *Estonia senior researchers*

'Dodgy' journals:

Participants in the Estonian research administrators focus group raised the problem of researchers publishing in disreputable journals, and Estonian junior researchers mentioned predatory journals. The practice of paying to publish one's research was viewed poorly by the junior researchers because it allowed for poor quality research to be disseminated:

> *- But was there not a case in Estonia, where people essentially bought publications? Although they did write the text, then they paid for it to be published, so that they could report one more publication?*
>
> *- So that you can buy an article for yourself?*
>
> *- But yes… if it directly contradicts some of these things, but I think it would be a good example of the lack of research integrity when you write a text and then you pay someone to get it published, to show that I have done research.*
>
> *- Wait, but the main problem with those articles was that these were not good enough, in the scientific sense.*
>
> *Estonian junior researchers*

However, the issue of 'dodgy' journals was disregarded as a real problem in the research administrator group and the participants thought that only those commenting from outside

academia identified this as a problem. The research administration staff viewed it as a 'non-issue' because they were confident of the self-regulation present in the scientific system that would not credit these types of publications:

> *We have had examples, like newspapers have raised alert over some dodgy magazines, I was scratching my head and thought, the journalist does not understand how science works, it is a total non-issue, it was a well-sold story for journalism, but this is a total non-issue. … [Publishing in dodgy journals] is acceptable, but it gets you nowhere. You cannot take it out of your CV, it will stay there. Each time I come across you, I look, wait, what have they done.*
>
> *Estonia research administration staff*

Citation issues:

Some problems regarding citation were identified in discussions of poor practices and misconduct in Estonian and Italian focus groups. Inaccurate reporting of citations or lack of critical review were thought to contribute to research being unreliable.

Inaccurate reporting

Inaccurate reporting of sources was identified as a problem by senior researchers in Estonia, which can result in original sources of work becoming distorted in later research building on the literature:

> *The other thing, I have also myself gone to search for the original-original source and it is not… what is said in the original source is not what I read through several interpretations.*
>
> *Estonian senior researcher*

Moreover, the senior researchers discussed experience of inaccurate reporting and citation of their own work:

> *- Citation also. By the way, have you noticed… I have quite a lot, at first in my own career, how my articles were cited and not only who cited, but what they had picked up. Half the cases it was total nonsense. I did not have such a result what was written there.*
>
> *- [On my research topic] all kind of nonsense is written.*
>
> *- The worst thing is when you are attributed a claim that you have never made, and your name is added.*
>
> *Estonian senior researchers*

Lack of critical review:

Individuals also expressed concerns about researchers failing to take an impartial approach to reviewing literature, leading to bias. In the Italian junior researcher focus group, not doing a thorough review of the literature was viewed as poor research practice, however it was also recognised that it is very difficult, if not impossible to review all the work in one's field of research:

[It] is impossible to read all the studies published in your field, even if specific

Italian junior researcher

In the Estonian senior researcher focus group, it was thought by one participant that young researchers are particularly vulnerable to looking for research that supports their ideas:

> *This is also partly related to impartiality… Often, especially in my opinion young authors tend to… their own ideas are so important to them that they look for all kinds of things to support it, even if it is wrong.*

Estonian senior researcher

But in the Italian research manager focus group, there were concerns that bias in the selection of literature can be attributed to nepotism:

> *The strategic use of quotes; so, you cite your friends and you do not mention the non-friends.*

Italian research manager

Furthermore, in the Italian junior researcher focus group, there was a worry that researchers can have an *"excess of trust"* in the work of high profile researchers or in articles that are published in top journals, which can be problematic because they can lack a critical approach when reviewing this work.

Misattribution of authorship

Problems regarding the accurate and fair attribution of credit for ideas and work was something discussed in Estonian, Italian and UK focus groups across the different participant groups. A problem of fake authors or assigning authorship to individuals who have not directly contributed to writing an article was raised as a poor practice. Italian mid-level researchers thought that assigning fake authorship can occur with or without the knowledge of the person assigned. Implicit to this problem is that assigning authorship in this manner is not really a fair reflection of the work that has been done, to either promote an individual or to give more weight to a paper:

> *…this practice that you have some supervisors or professors who put their names on the works of all their supervised works and who gather some 100 publications a year, and then somebody will look, whoa, he has 100 publications a year, so he is smart and writes a lot, although he himself has not written a single line.*

Estonian junior researcher

It was recognised by participants that fair distribution of credit requires negotiation, and some (but not all) of the Estonian junior researchers reported experience of assigning authorship:

- But have you ever encountered such abuse [of assigning authorship]? (Interviewer)

- Surely, yes. You complete a thing and everyone wants to come there.

- I haven't, for example.

- Is this the normal practice… or does it occur through negotiations and then turn into practices which seem to be… (Interviewer)

-Mostly through negotiating, when you are at the stage of publishing, then: you put him, why did you put him? Well, he did this, well, okay, something like that.

Estonian junior researchers

Moreover, in one UK focus group, it was highlighted that these and similar negotiations (about attributing credit on new research projects) can be difficult, where it can be hard to pinpoint and credit from whom ideas have originated. Appropriate distribution of credit was also viewed as being exacerbated by institutional pressures on researchers to publish or perceived ideals on author numbers:

…sometimes, if you work in a large group and you have a long and complicated discussion and someone walks out of there and starts a brand new research programme, where did the idea come from and is appropriate credit given to that because it really might just have been that someone made a throwaway remark and then someone else developed that further so those sorts of things I think are even harder really to… and especially if there is an institutional pressure, and it isn't the case here; I have been in other places and collaborated with people when they want to have as few authors as possible just, you know, so because the credit gets divided by the number of authors. Whereas actually, the much better thing to me often is to say well these people were involved, not necessarily may have produced table 3 but they have contributed to the discussion and therefore into their ideas, so I think there are some dangers there, especially in the setting where the number of authors matters. That it becomes very, very difficult to say well who had that idea at the beginning.

UK mid-level researcher

Indeed, number of authors was raised in Estonian focus groups, where it was discussed as a particular problem for big research groups, because it can be hard to compare contributions where lots of people will have been involved in producing the work:

Here in that sense is a simple fact, that speaking of authorship, that when there are big research groups, and all are included as co-authors, then this created a specific problem, that they are, under the article they can all be in the same line and in this sense, they are somehow quantified and the it is practically impossible to compare the contribution, in the sense what is the contribution of the project leader. What is the contribution of the people who carried out the substantial work, what is the contribution of the technicians, in one word, how they treat on another.

Estonian mid-level researcher

In the Estonian mid-level researcher group reports of previous incidents regarding authorship highlighted that researcher status can be influential in authorship malpractices, whereby junior researchers are vulnerable to not being appropriately credited as co-authors, which was viewed by participants as malpractice:

> *…there was a story in the media around 10 years ago how a professor collected students' essays and edited these into articles in his book and published it as his monograph. Has been also a story, a similar case, when you have a lot of supervisees, you can divide a larger topic between smaller blocks, you do this and you do that and if you publish it then in English, despite that the actual writers were BA or master students, the chance that they will stumble upon your published article, is not that big, you do not have to enlist them as co-authors, that is the slick point – do you want to put them as co-authors or not. If they have done it, you should put them.*

Estonian mid-level researcher

Indeed, similar vulnerability was voiced in the Estonian junior researcher focus group. Here, concerns about fair credit for ideas that may be routinely exchanged between academics at conferences or in the process of peer review, were discussed in terms of intentional misconduct through theft of ideas. It was thought that this could be an issue particularly for junior academics such as PhD students, who may be more vulnerable because they have less power and recognition in the academic community. Interestingly, this discussion also shares some overlap with the experiences reported by the UK mid-level researcher (above) with regards to peer review misconduct, where publications have been blocked:

> *-…what we have discussed with fellow PhD students, what happens for example when you go to a conference… to introduce your early research idea. What happens if somebody just steals your idea?*
>
> *- Before publishing? (Interviewer)*
>
> *- Before publishing, yes. And if it happens to be a well-recognised scientist for whom it is easier to publish things…. And then your whole project is gone.*
>
> *- Well, if you go to a conference, at least there will be a trace… But it can happen also [while publishing] in journal that the reviewer looks, hey, this is a really good idea, but I write a reject to him and then I take the idea and send it to another place. Then there would be no trace, at least not publicly.*

Estonian junior researchers

Mistreatment of others

The mistreatment of others was discussed and eluded to in many of the focus groups. However, it was mainly in the Estonian focus groups that it was specifically raised as in issue regarding the question of misconduct or poor practices. Much of the discussion regarding mistreatment of others revolved around abuses of power. Certainly, as demonstrated in the section on authorship above,

abuses of power by researchers were thought to particularly affect junior researchers. Indeed, in the Italian senior researcher focus group it was reported that there are cases where students can work for free at the end of their studies due to pressure from their professors. Indeed, members of the Estonian research administrators group voiced concerns that some supervisors of PhD students perhaps did not have their student's best interests at heart and could exploit them to work on project for their own gains. Instead, it these participants thought that supervisors had a duty to look after junior members of their team:[2]

> *- One of the points in the research integrity document could be that it should be the aim that your PhD students will be smarter and will go further than you, but we, if you look at the reality, then very often it is that we want to train them here into…*
>
> *- …those who you can sent to dig your flowerbeds at the summer house.*
>
> *- I see as their perspective that they are in my team… I think spelling this out is important.*
>
> *- Those who will produce my articles later.*
>
> *Estonian research administrators*

Estonian junior researchers identified women were as being vulnerable to abuses of power in research, using an example of authorship to explain how women may end up with worse authorship position than men, or potentially left off the list altogether:

> *For example, the distribution of authorship, is a place where the diligent representatives of the gentle sex have worked much harder but perhaps they are less combative, and even if they can, they write more and correct more mistakes, but their modesty will cost them so that finally there are more men among the authors, they are more often among the first authors and more important.*
>
> *Estonian junior researcher*

These examples above suggest that mistreatment of others happens on an individual level, however, interestingly, in the Estonian mid-level researcher focus group, one of the participants also suggests that institutions can also be implicated in unfair treatment of individuals. To exemplify this, they referred to a case where a researcher had lost their position to benefit a more senior colleague at the institution. This incident became an 'international scandal' leading to protests from the wider research community, also highlighting collegiality amongst academics:

> *Yes, there was a case at [university name], I won't mention any names where clearly [a person] was persecuted by higher powers. There are such cases… It was necessary to lay off the person, to create a professorship for people higher up,*

[2] This was raised in the UK senior researcher focus group in relation to defining research integrity.

because they had lost theirs abroad… It became, because the context was known, an international scandal. The professors from universities were sending petitions… and the person continued not as fulltime staff but could not be pushed out. In that respect I know there are really such people who try, who are consciously evil in my understanding, but they can be overcome if the community is ready to cooperate.

Estonian mid-level researcher

Another abuse of power was raised by participants in the Estonian junior researcher focus group, was that they had experience where professional and private relationships can sometimes be conflated in research work. The main person reporting these issues thought that this was quite a common occurrence within their institution which resulted in undue favours of authorship or work placements being made on the basis of private rather than work relationships:

- Some examples? I don't know. I have an example, like, the personal relations in a research group will hinder or on the contrary, or that they can be used…for example, for promoting a career. One example, your supervisor or your employer asks you to include a person as an author to your article, who did not contribute to the article but with whom he has personal relations, to help him/her. Such, such examples.

- Are these examples from the real life?

- This sounds familiar.

- It [happens] quite a lot at the university.

- Yes, in that sense. Also, those personal relationships that you take somebody to a project without a competition, but take a person with whom they have relations, not work relations but personal relations.

Estonian mid-level researchers

Finally, members of the Estonian research administrator focus group highlighted that mistreatment of others also includes courtesy when communicating with others, implying that treating people with respect was also an aspect of research integrity (see more on this below):

- For me it was a surprise, to be honest, to the whole of my generation it comes as a surprise how much at the university… you still hear that somebody in the context of science or management raises their voice to someone, I thought this theme is gone… Things occur… like an older colleague against younger colleague, communication beyond limits of courtesy, for me it was seriously…

- Exactly… and for me… Nobody has not yet raised their voice at me, neither as a junior researcher, researcher or senior researcher, but for me it also is related to one of the aspects of research integrity…

Estonian research administrators

3.2 The sliding scale

The focus group discussions show that individuals sometimes spoke about misconduct and questionable practices in terms of a sliding scale where certain acts (such as falsification) were

viewed as on the 'extreme end', whereas other issues were viewed as less serious. An example this can be seen in the following exchange between UK mid-level researchers:

> *- I think the worst one is making up data. That would be-*
>
> *- It does happen.*
>
> *- and then there is not keeping proper records of experiments of research and not replicating the data enough before publication or even in seminars…Those are things that- I think I start from the extreme end. It goes down.*
>
> *UK mid-level researchers*

However, discussions also revealed that participants sometimes found it difficult to identify where practices are positioned on the sliding scale because of difficulties in delineating whether a practice is bad research, questionable research practices or misconduct. This was because there was a recognition of complex factors involved that could blur boundaries. Some examples of this are in the UK senior researcher focus group where there were attempts to delineate 'bad research' from misconduct.

> *I've done bad research, we all have done bad research because sometimes you don't know until (laughs) well afterward whether it was good or bad but then the misconduct thing, that's of course a whole raft of other things…*
>
> *UK senior researcher*

Individuals' definition of 'bad research' can perhaps be viewed in contrast to their ideas of good research. As described in the previous section (2: Defining good research), one UK senior researcher had a strong notion that research should bring improvement to the world. He described research that had 'no use' as bad research, but not the result of misconduct. He described research that is not useable as purely theoretical work. It is published in theoretical papers and scores highly in the UK Research Excellence Framework, the evaluation system used to distribute public research funding in the UK. He suggests this is valuable to his employer:

> *I mean there's bad research but from my perspective that would be research that is not usable in any sense. I mean I've done plenty of that myself. I don't consider I was guilty of misconduct when I was doing that. I mean there are many people who would like me to do pure theory because of course it delivers much more highly on REF type dimensions so, you know, if I take the view that I have to please my school then I have to produce a certain number of theoretical papers every year in top theoretical journals, that's just the way it is. I think that's part of my contract with the university. It is definitely not misconduct to do that even though I don't believe that's actually the most useful way for me to spend my research time.*
>
> *UK senior researcher*

Indeed, this notion of bad research may not be shared by other individuals, who might argue that theoretical papers are not examples of bad research because they may be important in terms of developing new theoretical understanding, which was deemed by some as 'good research'. Moreover, proper methods were an important factor in the way participants defined good research and so it was not surprising that various failures to meet standards were identified as being

questionable research practices (see above).

Prominent in many of the discussions across participant groups and countries was talk of grey areas. Disciplinary and cultural differences regarding what constitutes questionable practices or misconduct became apparent in discussions, including some disagreement between individuals on where boundaries should be drawn.

Intention:

The role of intention in categorising acts of misconduct from poor or questionable practices was implicit in much of the discussions about misconduct and in some cases raised explicitly. Some mistakes were regarded as too obvious to be considered anything other than intentional acts, therefore, crossing the line from a 'grey area' to misconduct:

> *I have caught a clear falsification, where was, I can say from the bottom of my heart, that those guys falsified. Because, they had such a thing, let's say you have a graph, you measure certain points and you have a theoretical model the points have to correspond to, and it turns out, all is nice, all is… so idea. Only then it turns out that they had made a mistake in the mode. You have a very exact model that runs at each point, but in reality, this theoretical line that adjusts well with your points, it a total nonsense…. There was a mistake at calculating. How can such a thing happen randomly? I think the probability is not… If they had drawn the line correctly, the points would have been at a different place.*
>
> *Estonian senior researcher*

> *No, I would still say it's not a grey area. It is very easy to say that if a person lies it is a malpractice, but if the person leaves something unsaid, there are approaches that say it is also a lie. So, if you know the shortcomings in your research, if you basically already known that if we did a second experiment, I could refute the results of my previous test and what I wrote here in the article is wrong, but I will not do the other experiment, because I may not even dare to do it and I still publish what I have, then it is no longer a grey area, at least not for me.*
>
> *Estonian mid-level researcher*

However, some individuals conceded that it could sometimes be quite difficult to determine whether an act was intentional or not, where intention seemed to be a key factor in drawing a distinction between mistakes or poor practices and acts of misconduct:

> *- I find it really hard to draw a line between full on misconduct-*
>
> *(general agreement)*
>
> *- and just lack of conscientiousness and so it's hard to think in daily practice how you can identify examples of where you think that's a full-on misconduct, something seriously, intentionally, has been done wrong there.*

UK research governance advisors

Grey areas:

As the quotations about intention above suggest, where intention becomes less obvious, practices are viewed as 'grey areas' because it can be hard to distinguish whether they are mistakes or intentional misconduct. However, the term 'grey area' was also used when participants discussed practices that were viewed as questionable, or on the fringes of misconduct. Thus, issues such as self-plagiarism and salami-slicing/text recycling, exaggeration, poor research methods and authorship practices tended to be discussed:

> *The publication of the same thing, it is called self-plagiarism, I think, is a common topic, it is in the grey zone, it is not black. But it is not white.*
>
> *Estonian research administrator*

> *…a big grey area here where a lot of things can go wrong is we are entering this analysis process with a particular preconception what's going on and I think there's so much happening down the pipeline I think from your raw data to an answer to the question that is informed by decision making, human decision making, there's so much opportunity for bias there and getting- passing your raw data into variables you making decisions there that are- sometimes they consciously involve cherry picking and working out the way that supports your story best. Other times I think it's completely subconscious, but I don't think there's enough transparency at the moment to really be critical about it.*
>
> *UK junior researcher*

> *…there's a lot of grey areas that may or may not be; things such as bad authorship practices, so giving people authorship when they haven't made a substantial contribution is quite a big one, just mismanagement of data, but to be honest it can be anything where you haven't been fully transparent…*
>
> *UK research governance advisor*

In the 'grey areas', some individuals grappled with distinguishing when a practice is legitimate and when it crosses a line to become bad practice or misconduct. For example, in the Italian research manager focus group, one individual thought that self-plagiarism could be regarded as misconduct when citing oneself was unnecessary to the aims of the research:

> *[Self-plagiarism is misconduct when it] is not necessary to develop a certain topic [and it is used only] to fill pages and pages.*
>
> *Italian research manager*

Furthermore, a UK junior researcher highlighted that there was often a fine line between getting the most out of your research and overexploitation of data, demonstrating that sometimes negotiating appropriate research practices can be challenging for researchers:

> *There's a difficult balance as well between trying to get the most out of something you're working with and over-exploiting it because you never want to just leave something there and there's something you could work out from it rather than doing another study but at the same time if you're exploiting your data you might have found something that's really not there so there is a tricky balance there.*
>
> *UK junior researcher*

These difficulties faced by researchers also demonstrated the importance of the methodological rigour in research (such as reproducibility) as self-regulatory mechanisms to protect against or at least filter out poor research whether it results from accidental or intentional actions of researchers:

> *…we sometimes see people inflating their results so the sort of idea if you carry out a reaction and you report how effective that reaction is and there is sometimes a tendency for people to inflate those numbers, either accidentally or on purpose so it links to reproducibility but is actually also in terms of what you present.*
>
> *UK mid-level researcher*

> *In science luckily, this is good that if nobody can repeat the experiment, then in general these things will remain in history, they will never be so big that they will have real application in society, mostly.*
>
> *Estonian research administrator*

> *I was just listening to the scandal of dodgy journals and I thought about it, that it was blown out of proportions, there are regulatory mechanisms, there are disciplines that maybe allow it, but they ignore it and look badly upon it, this is not acceptable.*
>
> *Estonian research administrator*

However, some individuals highlighted that rules or boundaries of appropriate behaviour in academia, were not always clearly delineated. For example, in terms of authorship in publishing individuals in the UK and Estonian senior researcher groups highlighted that attempts to outline rules by journals are often vague:

The journals have also tried to explain what one can put into [articles], but in reality, it is still very obscure how the authorship is formed.

Estonian senior researcher

Moreover, in these focus groups there was also discussion regarding the boundaries of plagiarism:

But when does a knowledge become general knowledge where you do not have to refer to anyone anymore? Namely, a colleague of mine once got a review where he was reprimanded for plagiarising the fourteen cases of Estonian language.

Estonian senior researcher

Different rules:

As discussed above, individuals across different focus groups sometimes grappled with how to define when research practices are legitimate, questionable or acts of misconduct. It was also recognised that rules guiding practices could sometimes be vague, making it difficult for researchers to negotiate best practice. To further complicate things, individuals also identified that there can be differences between rules and practices across disciplines. These differences with regard to discussions about poor research and misconduct were revealed in talk about self-plagiarism and authorship. It was thought that there are differences in rules and requirements between natural sciences and 'soft' sciences and that certain fields might have agreed formats for authorship. Furthermore, it was highlighted that larger projects involving many different people, may identify individuals as authors despite them not being directly involved in writing manuscripts. Indeed, it was thought that for largescale projects, professional writers may be employed:

To me it seems that authorship is a topic that differs between natural sciences and the so-called softer sciences. A simple example is, we all have heard of the search for Higgs boson at the border of Switzerland and France, in CERN, and they have taken a rather liberal attitude which means that all who have contributed to the project during the project, will become authors of the publication, and therefore CERN issues publications with the content on some three-four pages, report the results of one experiment and it is followed by ten pages of authors list, true, it will then be shortened already in databases as CMS or ATLAS cooperation, to write something short under the title before the main content, but in reality all these people on the following ten pages will be indexed as authors. Well, it is not probable that all people wrote two words into the article and the article was completed this way. Probably it was written by professional writers.

Estonian mid-level researcher

Estonian Junior Researchers had the following exchange:

- It depends on the scientific field, I think.

- So, how does it depend?

- Like [in certain natural sciences] the first is the one who writes, the second, who was also involved in the writing process or he contributed much more than, for

example, the third or fourth. Or so on. And usually on the last position is the project leader or supervisor...

Estonian junior researchers

In addition to disciplinary differences, individuals also highlighted cultural differences that exist, rendering practices that are viewed as questionable in some countries or research cultures as un-questioned and normalised others. This issue was discussed in UK and Estonian focus groups in relation to grey areas, such as examples of authorship and self-plagiarism practices:

This fits well in my opinion with the example of the customs in Finnish universities, if you are a lecturer-researcher at a Finnish university, you do a thing, you will surely get the head of unit as your co-author, even if they never entered your room or looked at your data, you will surely get the dean as the co-author, in whose faculty you did it, because they created the conditions for you to do research, and perhaps somebody else who organised you copy paper or something like that. This is the working culture at those universities.

Estonian mid-level researcher

And if a machine will find it or I will with my red or yellow pencil. We had a case when a very good colleague of mine was self-plagiarising, I found it and asked her/him, and s/he said that it is a Mediterranean rule. Whereas a person can plagiarise up to 25%. All countries, Israel, Italy, Greece…

Estonian mid-level researcher

Coping strategies: methods to get ahead:

In discussions of grey areas such as self-plagiarism/salami slicing and exaggerating research, it was clear that some people in the groups were more sympathetic to the practices than others. These individuals, whilst not necessarily fully condoning the practices, nevertheless viewed them as predictable strategies that some researchers adopt to cope with or progress, in a competitive research climate.

In discussions about self-plagiarism/salami-slicing research (in Estonian mid-level researcher and research administrator focus groups), and exaggeration (in the Estonian and UK junior researcher focus group and Italian research administrator focus group), it was clear that some individuals pondered on whether these practices were just an inevitable part of getting one's research heard and disseminated widely. Thus, it was thought that repetition and/or drawing attention to one's work made researchers ideas more visible:

Here I am reminded of [a well-known scientist] who said that you have to write five articles about every idea – that I did not like at first, but now actually when I am older I understand that he was right. If you want that your ideas are heard, even the things that I write about… I still have to speak of the same at different conferences, that in my opinion is inevitable.

Estonian mid-level researcher

Estonian junior researchers had the following exchange:

> *-I know a lot of scientists who do some OK science, but who have managed to convince others that they are much better simply because they somehow promote themselves and hype themselves so much… It is also related to the belief that in the sense that if it brings you the competitive edge, the more you believe, the more you are stuck in your belief and in self- belief, and so on, the more you are able hype and promote yourself.*
>
> *- Well, but visibility is also necessary.*
>
> *- For sure.*
>
> *- If you write into the drawer, who will be interested. if it never reaches anybody…*
>
> *Estonian junior researchers*

Furthermore, some individuals were also sympathetic towards researchers who resort to these practices (exaggeration and text recycling or salami-slicing) since they were not viewed as misconduct or prohibited. Instead, it was highlighted that these strategies may be necessary, up to a point, to make one's research work appealing and publishable:

> *It's tricky isn't it because you always have to make it sound more interesting than you know it is and you know the faults are there and you kind of acknowledge them in the paper but nonetheless there is the convention of saying essentially this is the most important thing that's ever happened, here's what I actually did and then here's what I've done which changed the world. You kind of have to sell it.*
>
> *UK junior researcher*

There was some sympathy for utilising these strategies to facilitate research careers in a competitive research climate that values lots of publications:

> *As a general remark, here it is, this is not forbidden [text recycling], no law forbids it… I would not condemn these colleagues who quite consciously [produce for getting the points required by the system], they also have families and children, I do not see a problem why a person should not try, when he has such a cunning idea, though I have not tried that.*
>
> *Estonian mid-level researcher*

Similar understanding of the strategic practices of researchers were expressed about opportunistic topic selection in the Estonian research administrators focus group. Here some participants recognised that to obtain funding, by following fashionable topics, it can be easier for researchers to secure funding:

> *In some disciplines like in some other spheres of life there is a bubble, like real estate bubble, in science some fields are so hot… at one point it was that if you wrote micro into the grant application, you probably got the money, now nano*

> *has to be written into, if you want to get money. And so on. These are like fashion waves, where it is relatively easier to get money from various sources as these topics are interesting for a wider circle of scientists.*
>
> *Estonian research administrator*

There was certainly some disagreement regarding the seriousness of exaggeration, where some participants argued that making a big story out of one's research doesn't necessarily mean that individuals have used questionable practices or manipulated their findings. Although, they also admitted that *'it sometimes goes too far'*:

Estonian mid-level researcher:

> *…I think it is not the same thing, the inflating of a story does not mean necessarily that you are misinterpreting your data, this is how you sell it, this is the sales pitch, it sometimes goes too far.*

Furthermore, one Estonian mid-level researcher said that they preferred research with a big story:

> *I like the great narrative, in my opinion it makes you think. It is much more boring to read these articles from the 80s, where you have some concrete numbers, and then they do conclude nothing else than those particular numbers, and there is no story. Perhaps it is because you are already corrupted, but I cannot read any more this boring, with a couple of numbers.*

3.3 Perceived causes of misconduct, QRPs and bad research

In the main, the perceived causes of misconduct, QRPS and bad research was the competitive research environment, quantifying research outputs for evaluation of researchers and institutions for funding and pressures to publish. The academic system was viewed by many participants as being influential to the everyday practices of researchers. The example raised across the board was the pressure to publish.

Certain questionable practices such as self-plagiarism, salami-slicing and exaggeration were viewed by participants as being driven by researchers' desires to get ahead (or perhaps to stay afloat) in the competitive research environment.

Plagiarism, self-plagiarism, salami-slicing and text recycling were all viewed as practices that have arisen from the 'publish or perish' culture in research to maximise number of publications from research. UK senior researchers, a perceived rise in plagiarism in academia was attributed to pressures to publish:

> *- …so, academia is trying to catch up with the fact that this [plagiarism] happens more and more and that's because there are more conferences, more journals, more universities, more-*
>
> *- More pressure to publish in top journals.*
>
> *- Pressure to publish or perish, all this stuff so-*

UK senior researchers

Furthermore, many participants thought that pressure to produce publications could lead to a reduction in the quality of scientific methods, but also self-plagiarism as researchers attempt to maximise publication outputs:

> *Where it gets bad in my opinion is if the goal to produce 1.1. publications gives rise to giving in on the scientific method or self-plagiarism, if a scientist just copies the introduction section from article to article without practically rewording it. Because why bother to write it, and I know there are scientists who think that you do not really have to change the introduction. This is the place where the self-plagiarism manifests itself.*

Estonian mid-level researcher

Many participants thought that researchers' worth tends to be evaluated in terms of quantity of publications, rather than quality, leading to the need to maximise publications to succeed in a research career. This was discussed in the Estonian research administrator focus group in relation to self-plagiarism/salami-slicing, which was viewed as less valuable research in terms of quality, but regrettably recognised as a method that can help people succeed:

> *And the other thing is, the self-plagiarism, writing the same thing into three stories with different shades, I cannot denounce it for another reason. Namely, when it has been studied, which publication turns into a "killer", that will be cited, and which will start to produce requotes, this is quite stochastic, i.e. quantity is written into the equations, it is not, as I thought naively that if you publish in good, a high-ranked difficult journal, you'll succeed, quantity matters.*

Estonian research administrator

Quantity of publications was highlighted as an important part of the evaluation for receipt of funding to conduct research. Again, it was thought that the emphasis placed on numbers of publications for distribution of grants encouraged researchers to salami-slice research to maximise publications:

> *- I would say, [grants] are given [to researchers who salami-slice research].*
>
> *- I [think] the same, [grants] are given.*
>
> *- There are countries where in principle the number of publications is the most important indicator for getting grants.*

Estonian mid-level researcher

The competitive system of academic research was also thought to be a factor that can lead to the unfair treatment of others (for example the cases recounted in section 3.1 above regarding peer review, authorship and employment). However, one of the Estonian senior researchers hoped that because Estonia is a small country there was potential to avoid these problems:

> *In the social side, for me [the thing to avoid] is that good people are not treated badly. That they are good and fine scientists and they are somehow caught in the*

cogwheels of the system and this is just not right and fair and in the final end, will boomerang back. Here, Estonia is such a small country. This could be achieved.

Estonian senior researcher

Finally, lack of knowledge amongst researchers was identified as a cause of some misconducts and QRPs. It was reported that in the Italian junior researcher focus group, some participants thought that plagiarism amongst students can be a result of them not knowing that what they are doing is wrong. This idea that misconduct or poor practices can result from ignorance was also raised by UK research governance advice staff, who attributed some instances of unintentional wrongdoing to researchers not having adequate guidance or not being aware of policies:

I think as well sometimes its researchers not really knowing where to find information... I think that's a big problem. Where I work is they'll crack on with something, something will then happen completely unintentional, but they won't have known that that was an issue until someone says oh you need to look here but they've not been either told or they've not been made aware that you need to follow x, y and z and that can be found here and they're just like ok, didn't know about that…

UK research governance advisor

Indeed, this was thought to be especially problematic for researchers who are not part of a research group, highlighted in the following exchange:

And I think the individuals that are most at risk are those who work independently without being with a group-

(general agreement)

that's where you think that they're the most vulnerable ones that won't be able to access it.

UK research governance advisors

Independent researchers were viewed as particularly vulnerable because they lacked contact and supervision by peers, missing opportunities to raise awareness about appropriate practices and policies guiding research practice:

We do find a lot of researchers do obviously work on their own in silos and they haven't got that everyday contact with a group or even sometimes, you know, a supervisor or whatever, they're just off doing their research and they haven't got someone saying have you looked at this or are you doing this, you know, it's just having- they haven't got those check-in points so I think it has raised awareness of what is available.

UK research governance advisor

3.4 Outcomes of misconduct and QRPs

In all four Estonian focus groups and the UK senior researcher group there was some reflection about potential consequences of misconduct and QRPs. In two groups (Estonian research administrators and mid-level researchers) concerns were voiced about the implications of poor quality research on science as a whole. Here it was thought that poor quality research being labelled as 'science' could be damaging to the 'notion of science', presumably by making it appear less rigorous:

> *What I have noticed that many things are done that are not science, but which have a label attached to it as science… which dilutes the notion of science.*
>
> *Estonian research administrator*

However, there was also fears that the 'publish or perish' culture in academic research (within the domain of science) posed a risk to scientific method, because in the push to publish some researchers are failing to adhere to strict methods:

> *[Scientific method] is at risk when I look at it, it is at risk for the same reason that we have this great requirement for publishing and things are published where you can understand while reading the article that [the author] does not cherish the scientific method.*
>
> *Estonian mid-level researcher*

Moreover, the push for large quantities of publications was also feared to be at the cost of quality in publications:

> *- I would have also come to this that the [principle of] quantity that is entering science will be at the expense of quality, there is demand for publishing as much as possible per one employee, and then the same data is tried to be reproduced as much as the journals and editors allow.*
>
> *- Overpublishing.*
>
> *Estonian Research Administrator*

Another concern voiced in Estonian focus groups and the UK was that poorly constructed research, or research conducted with questionable practices such as 'cherry picking' data, can have a detrimental effect on the validity and reliability of the results of research. Indeed, this was identified as something affecting both social and natural sciences disciplines:

> *Yes, they are social scientific [issues], but in the natural sciences, you similarly have some variables. In this sense if there is a variable that can affect the experiment, and if you do not count this variable, if you do not control this variable, then the result is also not representative.*
>
> *Estonian Junior researcher*

The problem of unreliable findings was also viewed as a potential consequence of bias for positive findings in academic publishing. This was identified as particularly problematic for medical research, where meta-analyses are conducted to explore effectiveness of treatments such as pharmaceutical drugs based on publication evidence which is skewed towards positive findings. Thus, potentially resulting in inaccurate conclusions:

> *in medicine the situation is even worse [publication bias towards positive findings], because there is the standard of meta-analysis, which means that at one point somebody will compile all of it, all the articles studying one drug, and will look if the published results collectively show if the drug has a result or not. And if we have selective publication [policy], where negative results are not published, then great effects are seen in things that do not have an effect.*
>
> *Estonian senior researcher*

Furthermore, one of the UK senior researchers also highlighted how unreliable research has ramifications for further research building on it. Emphasising the importance of trust as a foundational element in the research community:

> *…a certain amount of trust is involved in much science, that's something that is experimented and got those results or all the results they got, not cherry picking them and so forth…*
>
> *UK senior researcher*

However, a participant in this group also noted that plagiarism (viewed by many individuals as serious misconduct) does not necessarily lead to the problem of unreliable results (depending upon the quality of work that has been plagiarised). Thus, plagiarism whilst misconduct, is arguably not necessarily bad science:

> *…But that makes me think of the number of ways in which research can be bad. I mean one is, as it were, it's simply you can't rely on the results… if somebody needs that result for the work that they are doing, a meta-analysis or it feeds into something else then you've got to be able to rely on it so something that affects the reliability of the results is bad and then there's bad in other sense of like being- not being perfectly well done, it's completely trivial and useless so if you needed to rely on it… that would be low quality- different kinds of quality, just little interest or little use. And so plagiarism is that different kind of sinning because to plagiarise something that's perfectly good then… in fact you might well want to deliberately plagiarise that quality of research (laughs), then is seen as it were the sin of the, you know, of the person- it's quite a different kind of sin it seems to me from, you know, poor quality research practices lead to unreliable research…*
>
> *UK senior researcher*

Interestingly, in the Estonian mid-level researcher group, unreliable research was viewed as less of a problem for academics because it was thought that they would be able to recognise shortcomings in research methodology. Instead, there were concerns that poor research that has got beyond peer review to being published, then becomes more available to the wider public and journalists. Here there was a worry that individuals from outside of academia may have the necessary skills to appropriately evaluate the research and recognise flaws:

> *…it is often discussed on relevant blogs, that if a scientific article with a weak scientific method with wrong conclusions that is not repeatable is published, then the scientists in the scientific community will recognize that this is crap. But the one who does not understand, is when the non-scientists are going to acquaint themselves with science which is easily accessible today thanks to Google, especially since we have the so-called Open Access journal model, which in itself is very good that every person can get acquainted with science. But this person does not have the filter to distinguish the quality research from lower-quality research.*
>
> *Estonian mid-level researcher*

Moreover, the problem of interpretation of science by non-scientists was also raised in the same focus group regarding work that has been exaggerated, to make it more sellable (not necessarily unreliable or poorly structured research). Here the concern was that journalists may be more likely to 'amplify' any exaggeration, making the research appear more significant than it really is:

> *In science news like with other news stories, you can see that a catchy title catches the eye and works as a clickbait, whatever, and then there may be really catchy headlines which to certain extent are related to how the researcher sells the results of his experiment, he argues that thanks to this little discovery, which in itself can be highly accurate, scientifically well-formulated discovery, but now this additional narrative creates a very big picture. And then the journalist, in turn, amplifies this image.*
>
> *Estonian mid-level researcher*

In addition to being damaging to overall research outputs by skewing evidence, publication bias was viewed as causing other problems in research. Estonian junior researchers thought that publication bias combined with pressures to publish can discourage replication. Thus, effectively hindering the self-regulatory mechanisms of research:

> *Situations occur when somebody does some sort of meta-study and says, see, I looked at 75 studies in psychology, and I could repeat the conclusions of only five, only fifteen. That the reproducibility is getting smaller the less frequently different people repeat the same thing. And then there is the pressure to publish things that are new, deal with things that have not been done before, instead of checking things that have been done before.*
>
> *Estonian junior researcher*

Furthermore, the lack of negative findings published was thought to be inefficient and wasteful in terms of resources because it was believed that researchers will be repeating unsuccessful research because they are unaware that it has already been investigated:

> *…if the hypothesis is, statistically speaking, sufficiently good, it finds statistical confirmation after the experiment, and then the positive result is publishable. But if an experiment was carried out, but the result was not obtained, it is more difficult to publish a negative result. The result is that a lot of experiments are done money spent on organizing some kind of experiments, on repetition of things that someone else has already done somewhere, but he did not get it published because the [positive] result was not obtained.*

Estonian junior researcher

> *But this is a known issue, in the scientific world, just there would be tens of times more negative results than positive results and the amount of information would change. But how many times these unsuccessful experiments are repeated because of not knowing, that has also a very high price for humankind, what we pay for bias.*

Estonian research administrator

Finally, some groups highlighted how some questionable practices could be detrimental to researchers themselves. This was apparent in the discussion about publishing in 'dodgy' journals (see above) where these publications would be evident on a researcher's CV and serve to discredit them. It was also thought that focussing on fashionable topics can be problematic for researchers because fashions can change, so that individuals can become stuck working in an area that is no longer in vogue:

> *I would not necessarily say that top science is, good science, I think that perhaps, on the contrary, top science may be bad science, because in science it is the same way that there are fashion trends that come and go, and often that which at one moment is top science, is some kind of fashion trend that gets stuck and which may not go any further and there would be a need to go change the direction. And then, if you are doing science only by directing yourself towards what is at this the moment… the mainstream which is stuck, then you're producing something that will not get you anywhere.*

Estonian junior researcher

In the Estonian mid-level researcher group, there was also reflection on how researchers attempting to 'play the system' effectively just leads to more and more people needing to do it. Suggesting that this is not just damaging to researchers, but the research community as a whole:

> *…what is a problem is that, on the one hand, this system is neoliberal and market-based, but it is very difficult for us to separate ourselves from this system. We cannot think that we are here, and the system is there, and we will use it. Because whatever we do or do in a different way, it changes our practice. It changes the existing practices of the scientist community…*

Estonian mid-level researcher

3.5 Dealing with misconduct, QRPs and bad research

The view that science and research are self-regulating practices, meaning that the overall product of the work (development of knowledge) is somewhat resilient to misconduct and questionable research practices, was implicit in focus group discussions. However, there were also instances where the self-regulation was explicitly spoken about as a benefit and a means to filter out poor quality research:

> *In science luckily, this is good that if nobody can repeat the experiment, then in general these things will remain in history, they will never be so big that they will have real application in society, mostly.*

Estonian research administrator

It was expected that bad research being conducted generally does not get published because of the process of peer-review which act to regulate what gets published:

> *So, I'm editing the (journal name) … you're sending stuff back because you say it's not good enough and so I get a lot of stuff that I send back without review…*

UK senior researcher

But as described above, self-regulating processes such as peer review are not infallible. There was criticism that peer-review can be unfair or biased towards certain topics, but also that research of poor quality or a consequence of misconducts such as falsification or plagiarism can get through the system to become published and in the public domain. Indeed, some things may be easier for the community to spot than others. For example, one UK senior researcher highlighted that plagiarism may be harder to identify than sloppy or incorrect work:

> *…if something was plagiarised we wouldn't be able to tell that immediately but if something was poor in other respects then that's something we'd hope that either we or the referees would be able to pick up on, poorly constructed, the arguments aren't good, vague and waffly rather than being precise and to the point…*

UK senior researcher

Many participants expressed concern that the way that science and research is evaluated is exacerbating pressures on researchers to publish, therefore contributing to the increase in questionable research practices such as self-plagiarism, salami-slicing, exaggeration and opportunistic topic selection. However, there was also some discussion that despite the problems with the current evaluation system, there is currently no better method to replace it. Thus, it was thought that to help overcome these problems, academia first needs to devise better systems of evaluation:

> *But in this regard… for every serious observer it is obvious that our evaluation system is in haywire, and the problem is that we do not have a better system, it is not as if everybody has so many ideas how to evaluate and the administrators are saying no, it does not go. In reality there just is not such a very positive universal evaluation program. We have to invent it.*

Estonian research administrator

There was some discussion in focus groups regarding rules of authorship, and recognition that these are not fixed and may vary across disciplines or even research groups. In the Estonian senior researcher focus group this was discussed, and some participants thought that researchers to ensure fairness, researchers should adopt the same rules:

> *The question is not if one [authorship regulation] is better than the other, but the question is that socially we have to play by the same rules.*

Estonian senior researcher

It was highlighted by some participants that some journals are taking a number of steps to improve things, such as action to facilitate repetition and checking by publishing datasets and, overcome

publication bias towards positive findings by reviewing articles before knowing the results. For example, in the following exchange between Estonian junior researchers:

> *- Some journals have made a very good system… they will take accept your article [for review] that includes everything besides your results, and then they decide whether it will be published or not, and only then you add the results.*
>
> *- Yes, that is one way ... to overcome this.*
>
> *Estonian junior researchers*

It was also recognised that journals could deal with published research that is poor quality, includes mistakes, or results from misconduct through publishing errata. However, there was concern that published work that has been retracted remains in the public domain and is not clearly marked as problematic or unreliable:

> *Well, some things that I have raised, the same, the autism case [an article with proved fabrication] was already on the table, what is very interesting – when you go to the journal page and download the same PDF and open the article, there is no commentary in front. If the retraction is made, that is not visible on the title page or anywhere. Down there perhaps a checkmark appears, look, there is a link to the article that the article was a fabrication, but in general… That is not the first thing running over the article.*
>
> *Estonian senior researcher*

The role of institutions was an aspect of dealing with misconduct or questionable research practices that was raised in some focus groups. In the UK, research governance advisors thought institutions have some responsibility to raise awareness amongst researchers regarding policies and guidelines to avoid them committing malpractice out of ignorance:

> *so, I think sometimes it's just making resources really obvious and making sure that new researchers, current researchers know if anything's changed, where it can be found and really shout it out about that 'cos otherwise it's just all the resources can be there but they're not necessarily being, you know, advertised to who needs to be looking at them.*
>
> *UK research governance advisor*

It was highlighted that institutions also need to be careful in how they deal with misconduct or poor practices that are a consequence of honest mistakes, where researchers may not be aware of their malpractice. In these situations, it was thought that institutions should not be too hard on researchers:

> *…the university has to play a really important role in that, so when we talked about kind of intentional or its just kind of an error, I think universities have to be quite careful and not penalise too much if actually a researcher doesn't know something 'cos the university doesn't have a system in place or training or a policy to help them with it…*
>
> *UK research governance advisor*

Certainly, the research governance advisors viewed incidents where malpractice has occurred due to mistakes as a learning opportunity. One advisor spoke of the benefits of enlisting individuals involved as educators, to help inform and raise awareness amongst other researchers to prevent further problems:

> *I think one of the benefits, well when you deal with these issues something I find is quite important is for those where there's a gap in the knowledge is really correcting them, preventative actions and its ensuring that it doesn't happen again but also you can use those people to- if you help them engage they can become your research integrity champions, for lack of a better word, then they can go out with their colleagues and say I made this mistake or I wasn't aware of this process but having gone through it, you know, I'm now fully informed of what I need to do to get my research to be done properly.*
>
> *UK research governance advisor*

However, some researchers also thought that institutions do not take strong enough action to deal with misconduct. They had a perception that there can often be a lack of consequences for researchers who behave badly, whereby only in severe cases are people subject to punishment:

> *Only rarely it is a big scandal [after misconduct], people are dismissed and so forth, but typically just either nothing is said or [a warning] don't do it again.*
>
> *Estonian senior researcher*

One UK senior researcher voiced concerns about how misconduct is dealt with, referencing the Stapel case.[3] He thought there was an unwillingness of the academic community to take some responsibility for failings in peer review that enabled Stapel to prosper:

> *But I mean for me I think this whole idea of, you know, this self-cleaning ability of the academic community and peer review is under a big question mark for me because of their response that we saw there [Stapel case] which was all people looking in a different direction. 'It wasn't me, nothing to do with me', you know.*
>
> *UK senior researcher*

Summary

There is a wide range of problematic practices in research, but it can be difficult to draw the line to label something as misconduct. Intentional falsification and fabrication were considered to be rare but serious. Plagiarism was viewed as less clear cut where individuals may not intentionally act dishonestly. Questionable research practices varied from using poor methodology and citation to issues such as exaggeration of research findings, self-plagiarism and salami-slicing research.

There was some disagreement between individuals regarding the seriousness and wrongness of some 'grey areas' such as self-plagiarism or text recycling. Many thought these were questionable practices, but others rationalised them as inevitable consequences of a competitive research environment and were sympathetic to researchers playing the system. However, there was also

[3] Diederik Stapel was found to have fabricated and manipulated data on a large scale.

concern that by altering practices to work the system, researchers end up making these practices more necessary.

Researchers of higher seniority seemed to have greater knowledge of concrete examples of misconduct and questionable practices, probably due to their greater time and experience working in research compared to more junior researchers

Participants showed implicit confidence that academic research is self-regulating so that results of misconducts and poorly conducted science will eventually be worked out through processes such as replication and peer review. However, where research findings move beyond academia, there were greater concerns about how unreliable or exaggerated findings might be interpreted and used by those who do not have scientific or research training. Some voiced concern about use of research by non-scientists who may be unable to detect questionable methodological practices in some published research, and therefore may report findings inaccurately.

It was thought that misconduct and QRPs can be damaging to science as a whole, as well as to individual researchers. Causes were largely viewed as stemming from a competitive system with increased evaluation of research based on the number of publications, rather than the quality of research.

4. Defining research integrity

Overview

Research integrity resides in research findings, individual researchers, research institutions, and science as a social system (Meriste et al., 2016, p5). Integrity has two meanings. One is structural; integrity can mean completeness, wholeness, and soundness. The second meaning is a moral one, sometimes characterised as a virtue that keeps the balance of other virtues in check (Cox et al., 2003). A person with integrity shows a commitment to morality and is reflective and critical of the values she holds. Thus, research integrity can be understood as a "researcher's commitment to professional values, which reflects in both attitudes and actions." (Meriste et al., 2016, p5).

Participants picked up on both the structural (for example methodological soundness) and moral aspects (for example honesty) of research integrity, though did not identify them in terms of structural and moral. Participants from Italy identified a difference between the *integrity of a researcher* and *research integrity*, noting that one could behave unethically without the quality of work being affected.

In general, participants found it difficult to define research integrity and discussion centred round characteristics of research with integrity. Participants identified the following aspects of research that they regarded as marks of research integrity: methodological: good research methods, social: treating people with respect and doing socially valuable research, personal: being a good, honest person and adhering to ethical guidelines. Elsewhere, researchers have defined integrity in terms of "honesty, transparency … objectivity, and generally stressed the importance of sticking to the research question and avoiding bias in data interpretation…. Researchers regarded truth as the key aspect of integrity, though they expressed this in different ways and with various emphases on honesty, transparency, and objectivity." (Shaw and Satalkar, 2018).

4.1 Difficulties in definition

In some of the focus groups, when asked to define research integrity, participants found this a difficult task and explicitly stated this:

> *- I am not really sure what it means. Well, I do not know. I think you should go first.*
>
> *- I cannot even define it in plain Norwegian, I think.*
>
> *Norway junior researchers*

> *I think that it's very difficult to define research integrity…*
>
> *UK mid-level researcher*

In the Italian junior and mid-level researcher focus groups, it was reported that participants did not directly define research integrity, but instead spoke in terms of what it is not, i.e. research without integrity *"falsifies data"* or has *"conflict of interest"*. Indeed, this approach to understanding research integrity was also evident in the Norwegian research administrator group, who recognised that lapses in research integrity may mean several things. They suggested that the group use clear points of reference to ensure that they are discussing the same issues:

> *Yes, well, when are we dealing with cheating? When are we dealing with grey areas? Debatable… It is also for example possible to make mistakes. So, I think it would be helpful if we use some illustrating examples in the discussion, so that we know that we are discussing the same topic*
>
> *Norway research administrator*

Similarly, in the UK senior researcher group, lapses of research integrity were discussed where the misconduct of Diederik Stapel was used as an example of an extreme failure in research integrity and, akin to definitions of bad research, there was a view that lapses of integrity have a sliding scale of seriousness:

> *- …So, my feeling that is- I mean there are some extreme cases of obvious dramatic failures of research integrity. There was a case not long ago in the Netherlands actually with an experimental psychologist who-*
>
> *- Oh yes (laughs) famous.*
>
> *- who faked his data… ok, so there are those cases [like Stapel] but then I think those cases aside most people who kind of slip into research integrity it's probably because they've started cutting corners because of some kind of pressures somewhere, you know, and probably then you get away with it because the oversight is not so huge and it's a sliding scale isn't it?*
>
> *UK senior researchers*

Research integrity was perceived by participants to be a concept with some fluidity which complicates attempts to provide definitions. One of the UK mid-level researchers emphasised how

integrity was aspirational and thought that the relevance of integrity for researchers develops and changes over the course of their careers. It was thought that different types of work bring different issues to the fore:

> *…it's a really difficult thing to define properly but it's something that we aspire to throughout our careers. It's not something that you can start with at the beginning, you have to learn it bit by bit. You have to be a reviewer and you have to be integral, you have to be a researcher in the first place and have the integrity not to make up data, you have to have the integrity not to- but to reproduce your data. You have integrity to do these things, so its starts with that and when you are a reviewer it becomes different.*
>
> *UK mid-level researcher*

Many participants thought that research integrity also has different meanings or relevance for different disciplines due to different methodological best practices:

> *Probably there are a bit different rules in different scientific disciplines, and what is a right and good method in one might not be the best method in the other discipline. Definitely, we can say there are at least differences between the natural sciences and the humanities.*
>
> *Estonian mid-level researcher*

> *…going back to what I was saying, so it's very hard to define research integrity but talking about guidelines, I mean they're going to be different for different disciplines so that's why it becomes a bit, even more complicated…*
>
> *UK mid-level researcher*

Moreover, it was evident in an exchange between Estonian mid-level researchers, that within broad academic fields (e.g. 'natural sciences' or 'humanities'), there are different schools of thought. Thus, depending on their approach, researchers may advocate or criticise different methods of working:

> *- …I would also add abstaining from false methodologies, that in the humanities, I as a [representative of a humanities discipline] …my research area is completely consistent from Estonia to France, Germany, and the USA, and completely excludes the so-called post-modernist deconstructionism… It is difficult to describe… in addition to scientific methodology, not to fall into a pseudo-science, such as Derrida or Foucault, or Lacan who simply utter… the whole world quotes them. For example, one of the creators of the method in principle is Michel Foucault [who] has written a whole series of pseudo-scientific books that are liked by very-very many, but every serious historian realizes that it is wrong, he does not have any references*
>
> *- …I will defend Foucault a little, because he has influenced me a lot, that he was a philosopher, not a historian.*
>
> *Estonian mid-level researchers*

Whilst the Estonian mid-level researcher quoted above stated that there was consistency in their research area across different countries, a UK senior researcher pondered whether standards within academic fields could also vary across countries or cultures:

I think that different fields do have different standards and possibly different- that may vary also from country to country.

UK senior researcher

Finally, there was some discussion regarding whether there is a difference between *research* and *researcher* integrity. This theme was particularly prominent in the Italian mid-level researcher focus groups, who all agreed these were different things. This further highlights the difficulties in defining and understanding the notion of research integrity and demonstrates different aspects of integrity in research that require consideration:

- A good research and a good researcher are two different things, because you may have various unethical behaviours that don't affect the quality of your work.

- I might do a research of high quality and at the same time I could violate ethical rules.

Italian mid-level researchers

4.2 Methodological aspects

As previously described in section 3.5, many participants perceived science and research as a self-regulating system, in which methodological rigour was viewed as an essential component:

in the end, in science there is something visible that is a sort of progress, let us say, which is based on certain rules, the scientific method…

Italian senior researcher

Therefore, analogous to definitions of good research, good methodology was overwhelmingly viewed as one of the central aspects of research integrity:

[research integrity includes] all those things [methods] which can enhance the good scientific results

Italian senior researcher

Furthermore, corresponding to the discussion of 'research' integrity by Italian mid-level researchers above, practicing research with methodological rigour was viewed as giving the research integrity. As one UK research governance advisor stated, this is beneficial to researchers because it gives research strength:

…it [good methods] also allows for researchers to demonstrate to a global (inaudible) that your research is undertaken with rigour, with integrity, with transparency, with openness, and that's benefit to your research as a direct result. If you can demonstrate that your research was undertaken with integrity then it just makes your research strong, definitely.

UK research governance advisor

The discussions of methodological aspects of research integrity across the different countries and participant groups tended to focus on four key areas: replicability, transparency, truth and thoroughness.

Replicability

It is apparent from the discussions about definitions of good and bad research that many participants viewed replicability as an important part of rigorous scientific methods. Thus, reproducibility was similarly specified by some as an essential component of the methodological aspects of research integrity:

> *Everything [regarding integrity] is based on the scientific method, on the reproducibility of the results.*
>
> *Italian junior researcher*

However, it was also recognised that replicability may not be so essential to other non-scientific disciplines, where analysis is interpretive:

> *- Good science is replicable science, I know I am stepping on the toes of historians and lawyers saying that, but let me say it.*
>
> *- And historical research is also replicable only if the sources are properly cited. There is also a question of interpretation, but this is the same in whole science, how/if two persons interpret the same date differently or similarly.*

Indeed, some researchers from non-scientific backgrounds also highlighted that reproducibility was not possible or most relevant in their fields due to their epistemological approaches. For example, an Italian mid-level researcher argued that different researchers in social sciences will never get the same results despite following the same methods because *"the role of the researcher is fundamental"*.

Transparency

The importance of transparency in relation to research integrity was raised in many of the focus groups from all four countries across the different participant groups. Transparency was identified as essential part of research integrity because it enables other researchers to scrutinise and replicate the work of others; thus, facilitating the self-regulating system of research:

> *I think that when it comes to integrity I expect robust transparency when it comes to how the data is gathered, and that this process is open and replicable in a robust way, so that other researchers can see how you worked, what your assumptions are. Because when one speaks with an authority based on all kinds of mystical - "I have so much practical experience" – well then you are left with mysticism, and that is not relay what science is about*
>
> *Norwegian research administrator*

> *I'd say be transparent and honest about what you've done 'cos it still happens remarkably often that I'll go through a paper that has an interesting way of doing*

things and I try and work out exactly what they've done from the methods and I can't and that I feel is a problem so, yeah, the transparency so that people can do what you said you'd done is quite important.

UK junior researcher

Moreover, as well as openness, transparency was described in terms of not concealing anything:

An openness about methods and findings, and not hiding anything.

Norwegian junior researcher

In addition to methodological checks, transparency was also identified as important in protecting against conflicts of interest in research. Here it was thought that being open about one's funders is important because they could be influential in the ways researchers interpret their results:

…in some areas, not really in my area, but you kind of- you might be being funded by, I don't know, a pharmaceutical company or something and I suppose being specific about those connections and funders and that sort of thing. I mean it's not something I personally have much to do with, but I can imagine that you might almost be being asked to kind of produce certain results from your funder and things.

UK junior researcher

Truth

Akin to some researcher's notions of good research (see 2.1), truth was identified as a focus for research with integrity in two of the Norwegian focus groups:

[Research integrity is] … the commitment to thoroughly study the questions we are wondering about and seeking a truth, or at the very least finding better understandings of our reality…

Norwegian senior researcher

Adopting appropriate methods was viewed as a key part of striving to obtain truthful research results:

What do I consider good research? The whole point is to try to discover something that is true, somehow […] Integrity must be measured by this standard. That is, by how true the results are, or how truth-seeking one tried to be.

Norwegian junior researcher

Thoroughness

Completing work thoroughly, without cutting corners or being 'sloppy' was another methodological aspect of research integrity that was identified in some UK and Norwegian focus groups. Like the UK senior researcher above (see difficulties in definition), it was thought that pressures can lead to researchers rushing work, subsequently leading to poorer quality research outputs:

> *… a lot of science is fast-paced, and then one does not have the time to double check and confront one's own interpretations. This might be where the challenge lies – not working long and thoroughly enough with the problems we are exploring*

Norwegian senior researcher

A UK junior researcher thought that it was part of integrity that researchers ensure that they make every effort to produce thorough, and therefore valid, piece of work:

> *I suppose in a way it's also your job to do a really thorough literature review and to find out who else might have worked on this and so in a sense I suppose in some ways you shouldn't be making mistakes at this kind of level but, yeah, so in a sense integrity is kind of- like making a real effort to produce a really detailed piece of substantiated piece of research.*

UK junior researcher

4.3 Social aspects

Another facet of research integrity discussed in many of the focus groups was social issues involved in academic work and conducting research. Social aspects of integrity broadly focussed on two core issues: respecting people in research (and to a lesser extent other animals) and producing research that is socially useful. Respecting people was the most widely discussed issue specifically in relation to research integrity and was discussed in focus groups from all four countries and across the different participant types. In several focus groups, there was discussion about the importance of respecting and protecting research participants and (in the UK, junior researcher group) animals:

> *"I'm just wondering to what extent, I mean the obvious things about being ethical, about your participants, etc., etc., but also (pause) yeah, I wonder if that's probably- research integrity not only participants but also animals etc. All these things I think…*

UK junior researcher

In the Norwegian senior researcher focus group, several participants reflected on an example of research conducted in Norway known as the 'Stovner case'. Here, research was conducted about a district of Oslo where the findings were perceived by participants of the research as stigmatizing and as an inaccurate reflection of their experiences. This case was influential to the way that researchers in this focus group viewed respect for participants. They therefore, saw the responsibility of research as going beyond ethical requirements of direct contact with research participants (e.g. to maintain confidentiality), to also thinking more about the implications of the findings on participants:

> *[dealing with participants is more than] … keeping confidentiality and anonymity. It is also about how you describe their situation. It has to be recognizable for them in some sense. They should not feel like they are being exposed*

Norwegian senior researcher

The issue of stigma was also discussed in the mid-level Norwegian focus group. Furthermore, one of the UK research governance advisors who worked with National Health Service (NHS) projects

involving patients, with direct implications for patient care, identified that impact of research on participants as an important reason for promoting research integrity:

> *"I think from my perspective and working… alongside the NHS, for me research integrity is so important because it could have- it can have a real world impact on patients, you know, straightaway, if something's not done right, if the procedures aren't followed as they should be, if things aren't made publicly available then that can have a real serious, quite immediate impact so for me I feel it's why I find research integrity so important."*

UK research governance advisor

It was highlighted by another UK research governance advisor that it was important for researchers to adhere to research integrity guidelines, so that they can demonstrate that they have taken necessary steps to protect participants in their research, as a means of protecting themselves. The reason for this provided was that increasingly research participants are checking and challenging how research is conducted:

> *…to go back to what the research integrity statement means, it's also protection for both participants and the researchers themselves. It's a way of ensuring that participants, their dignity is protected and participating in research, and it's also a facility that allows us to protect researchers because they do invariably, I don't know in your institutions but certainly in ours we're starting to see more challenges coming in from members of the public all on the types of research that is being conducted and by being able to say yes well this researcher went through all regulatory approvals, is engaged in research integrity, research and ethics, you know, then you can justify the research, it adds that layer of protection for them which is where research integrity again can be very important and beneficial.*

UK research governance advisor

A second aspect of respecting people identified by participants was regarding co-worker relationships in research, although some individuals thought that this was separate to research integrity, and instead an issue of *researcher* integrity. Nevertheless, good working relationships were viewed as an important part of research integrity by other participants (from across all four countries), who did not make such a strong distinction:

> *One should have respect in one's working environment and simply treat one's colleagues with decency.*

Norwegian senior researcher

In the UK mid-level researcher group, social aspects such as fair treatment of co-workers were spoken about as more ambiguous and contextualised "subtle" and "soft" aspects of research integrity, in contrast to the "hard" methodological elements of the concept:

> *So, I think there is a hard core that is understood by everyone, the soft and dynamic thing is what you do if someone gets it wrong… I think that the hard core of it* [research integrity] *is getting back to let's do good science and then the much softer thing is let's behave like adults and let's be professional about this.*

UK mid-level researcher

Researchers spoke of students and co-workers when talking about this issue. However, particular to senior researchers was the treatment of members of their team or subordinate colleagues. This issue was highlighted as particularly important by one of the UK senior researchers, who described a sometimes-delicate balance between managing the interests of the research team as a whole and his responsibility to ensure that the needs of individual team members are met:

> *Well there's a key issue which is how you treat the other members of your team and I would say that's probably the critical issue in research integrity for me personally… there's usually a conflict between, often not always, a conflict between what's in the best interests of the particular person of your research team and what's in the best interest of the team as a whole because the team as a whole is usually- its success is defined in very simple terms, in terms of the proposal that you wrote and the reason that you got the money and that you're offering key milestones, I mean that's pretty straightforward but there's also the issue that the people that you're able to recruit into your project aren't necessarily the ones who have the perfect fit for the role that you wanted, that's always the case and if you see someone who's good who's not the great fit then you might still want to take them on. And then the issue is what your responsibility is to that person…*
>
> *UK senior researcher*

Another UK senior researcher highlighted how methods and approaches in academic disciplines could also have an effect on social aspects of research integrity. Here, tough discussion styles in philosophy, emphasising combative arguments have been thought to contribute to gender inequality in the field of philosophy, which the participant thought emphasised the importance of behaviour in the research environment as a research integrity issue:

> *So in philosophy nationally, internationally in fact, there are worries about gender equality that focus in part on a certain kind of research culture, particularly 'cos its- coming back to Socrates as a culture where we put a high value on people in discussion having arguments with one another but where those can be quite combative and even aggressive and isn't just a matter of discussing so we get the right answer but proving that you're right and the other person's wrong (laughs) in unnecessarily combative and confrontational ways which people have thought contributed to gender inequalities in terms of numbers going in through to the profession. I mean I think that's an area where one could think of- the culture and I think, you know, we could make it regarded as an issue of research integrity, how you behave in a research environment.*
>
> *UK senior researcher*

Finally, another element of the social aspects of integrity that was discussed by some researcher participants in Estonia, Norway and the UK, is that research should be useful to society (this overlaps with participants' notions of good research in terms of improvement). Research that had social relevance and benefits was specifically identified as an important part research integrity by a few individuals:

> *… and this is a social responsibility I believe we have as social scientists – making a better society. We are not supposed to make a worse society, our task is not to*

make conflicts – so I think this is a part of the integrity, to contribute to good solutions for as many people as possible.

Norwegian senior researcher

4.4 Personal aspects

The personal aspects were deemed by some as *researcher* integrity (detailed above), however, as with social aspects, others saw personal dimensions as a part of research integrity. Personal aspects were spoken about in terms of being a good person, honesty and obeying rules and ethical guidelines. Being a good person was described as behaving well towards others, and having an awareness of the social elements of research:

…coming back to how you would define integrity… to me it's always I try not to do things that I would be very upset about if someone did them to me because I think ultimately our research system is a social interaction…

UK mid-level researcher

Another UK researcher described the importance of personal integrity as working to the best that you can and putting right your mistakes:

…ok so people do make mistakes, you make some mistakes in your analysis, you might look back on what you found out later but at the time you did what you did because you thought it was the right approach and maybe you used the wrong methods or you didn't quite ask the right question in your survey than you would have done in hindsight but, you know, at the time you did the best what you could do in an honest way and you didn't lie or exaggerate your results or steal someone else's work without, you know, giving them credit. And maybe sort of inadvertently plagiarised. You might not have realised that someone else has done something very, very similar but if you're able to correct that, that should be better but as long as you didn't know at the time. That's at least personal integrity I feel.

UK junior researcher

What is evident in the previous quotation is that honesty is an important factor in the personal aspects of integrity. Certainly, honesty was specifically mentioned by several researchers in terms of remaining impartial and critical in one's work:

We will talk of another aspect too, that in my eyes good science or a good scientist is the one who, let's say, the logic of competition is imposing itself, and if you can remain honest with yourself in this context in the sense that you do not overhype yourself.

Estonian junior researcher

I think a big practical part of research integrity is also that well it's the honest thing, the openness to learn or accept it that you might be wrong…

UK junior researcher

Finally, another personal aspect of research integrity identified was the view that researchers should be obedient of rules and ethical guidelines at all times, including when no-one is watching them:

> *…it's [behaving with integrity] just doing the right thing even when no-one's watching is a kind of old C S Lewis quote but it's something we use quite a lot so it's just knowing what the rules are and complying with them really*

UK research governance advisor

Norwegian junior researchers thought it was important to *"have a backbone"* when facing pressures that may make this challenging:

> *[Behaving with integrity is] not allowing oneself to be pressured into breaking principles or ethical principles. Research ethical principles.*

Norwegian junior researcher

4.5 Importance of research integrity

The question of the importance of research integrity was developed for the research administrator/managers/governance advice staff focus groups. However, findings were only reported from the UK research governance advisor focus group and are therefore limited to this perspective. The participants thought that integrity was important for reasons of trust, legitimising research and meeting requirements of funders and publishers.

4.5.1 Trust:

Several participants had the perspective that research integrity is important because it protects human participants from harms, protects researcher and institution reputations, as well as protecting research more widely by being important in engendering public trust and ultimately the future of research:

> *...it's really important because of the impact it can have if something goes wrong and it's not just on particular participants or individuals but research integrity errors can impact on a researcher's career prospects and their own reputation as well as an institution's, but that's kind of a secondary issue, but it's also about the future of research as well, we want to safeguard that to make sure we have research forever and will have jobs so ultimately it's a bit about that as well, just maintaining public trust and confidence I think.*

UK research governance advisor

One participant highlighted that research integrity is important for maintaining trust amongst scientists, by promoting researchers to conduct work to high professional standards that can be relied upon amongst the research community as well as more widely in terms of the usefulness of research findings:

> *- I think trust is a really good one.*
>
> *(general agreement)*
>
> *- In fact I think in the community everybody has an element of trust that everybody is working with integrity and that's the assumption isn't it, that you will automatically always assume that your colleague is doing what they should be*

doing right and when you hear of these terrible stories where something- there has been serious plagiarism, making up of data and things like that, its incredulous, you can't believe that someone would have the gall to do that and build a whole career out of it. It's about how research is perceived and that's why it's so important.

UK research governance advisors

4.5.2 Legitimising research:

Participants also discussed research integrity in terms of using good methods to produce robust, reliable research was important to demonstrate legitimacy of one's research amongst the research community. One participant highlighted the rise in data repositories and that scrutiny of data was becoming increasingly important:

…increasingly now, as data repositories are just as important as publications for scrutiny after the event it's so important because going forward more and more people will be looking into other studies' data and how things were conducted.

UK research governance advisor

Furthermore, following institutional rules and procedures was perceived as helpful because it introduced consistency and transparency in the planning and oversight of research:

It's to keep consistency as well across the board, so everyone's taking the same approach, it's having to do the same thing and I think that really helps with transparency where everyone is starting and go through the whole same process then.

UK research governance advisor

4.5.3 Meeting funding and publication requirements:

Openness of data was identified as an important issue for researchers to engage with because it is becoming increasingly important for funding and publication:

…the importance of it again, where it will impact researchers is it's a funding requirement, being able to demonstrate- and it's a publication requirement so it's the researchers' bread and butter, they need to get the money in and publish, and they need to engage with research integrity as a result.

UK research governance advisor

4.6 Is research integrity discussed often amongst colleagues?

This question was not reported consistently across all groups, so that there is no information regarding this from Estonia or Italy, nor from the UK research governance advisor group. Of the information collected, two themes were identified: difficult discussions (where participants describe

perceived barriers to discussions about research integrity) and productive discussions (describing educational and positive discussions about research integrity).

There were mixed accounts regarding the extent to which participants thought research integrity was discussed among colleagues on a day-to-day basis. Some participants reported that research integrity was discussed. However, others did not think that discussions about research integrity happened very frequently.

4.6.1 Difficult discussions

There were a number of factors identified that were thought to be boundaries to discussing research integrity. First, one of the UK junior researchers thought that some aspects of research integrity are assumed to be common sense and so obvious that they were not discussed:

> *- It's kind of like in some ways some of it is never discussed and it's just more left to common sense, you know. When I was studying my degrees at undergraduate and postgraduate I don't think a teacher ever said to me you should never lie and make up results-*
>
> *(group laughter)*
>
> *- It seems so obvious that it's just something that isn't even discussed in the classroom.*
>
> *UK junior researcher*

An issue that seemed implicit in participants' talk about research integrity discussions, which was also explicitly identified by some members of the Norwegian research administrator group, was that they can be sensitive and controversial, making discussions difficult because they can be seen as challenging:

> *Yes, but then the question arises about – what should I say – open arenas for asking the questions that can be controversial and sensitive because you challenge something in a way*
>
> *Norwegian research administrator*

Indeed, several participants thought that the hierarchical structure of academia can be counterproductive to discussions about research integrity, making it particularly difficult to challenge senior researchers:

> *…I think that when researchers feel that when they have worked themselves into a certain position or have become professors or something, they become very insulted if one kind of want more transparency in what they are doing, because they might believe that they somehow deserve a kind of eternal respect – now they are just going to rest on the laurels*
>
> *Norwegian research administrator*

In particular, power imbalances between junior and senior staff were viewed as problematic, where junior researchers can find it particularly difficult to raise issues with more senior members of staff; even in situations where there is a clear violation of research integrity:

> *… I was quite young, it was two professors who had done the writing, and by chance, I discovered that a whole page was a direct copy of a report. An English report, where they had just incorporated it entirely. Then I was like: How should I raise this issue with them…?*
>
> *Norwegian mid-level researcher*

Indeed, a Norwegian junior researcher thought that junior researchers might feel vulnerable in discussions about integrity issues because they lack the status of senior researchers:

> *there are discussions in all fields about what is right and wrong, and if one disagrees or tries to bring in nuances, one might feel a little exposed. Especially of one does not have these… titles*
>
> *Norwegian junior researcher*

Another factor thought by some to inhibit discussions about research integrity was familiarity. A Norwegian senior researcher thought that familiarity amongst co-workers can lead to a situation of over-politeness, where individuals may not be critical enough of their colleagues, to the detriment of research integrity:

> *… when we present an article we thoroughly present the premise, how I worked with the data, work with transparency and that one maybe can get a better discussion about the quality of the research. Is it good enough? Is it adequate? One could be a little stricter with each other and one can do this in a respectful way. I am a member of a research group where it used to be a very though environment, but now we are very kind to each other in academic discussions and fundamental criticism rarely emerge*
>
> *Norwegian senior researcher*

Furthermore, some participants described that it can be particularly difficult to raise issues with colleagues. Indeed, two Norwegian research administrators reported that they thought it was easier to discuss more general issues or external individuals than particular issues of integrity within a department or concerning colleagues:

> *Yes, [discussing people from other departments]. It is much easier then. Then you can talk about it during lunch or in the hallways. However, then I see that I am more unsure about what my colleague in the office next to me is doing, and I have talked to people who are more unsure about what to do. Should I talk about it with the person? Should I talk to my boss? Or, have I perhaps misunderstood something?*
>
> *Norwegian research administrator*

However, contrary to this, a UK mid-level researcher described finding it easier to discuss research integrity issues amongst his research team, compared to external teams, where discussions were perceived as much more difficult:

> *I discuss it with my group, but I find it really difficult to bring it up to other groups because I basically- at any time I'm telling them I have an issue with your integrity so and there is no easy way of bringing that up.*
>
> *UK mid-level researcher*

These challenges raised about discussing research integrity demonstrate the sensitivity around dealing with this issue, amongst colleagues and peers. However, a more practical issue highlighted in two of the Norwegian focus groups was that lack of time can be a hindrance to discussions. One researcher stated that this meant that they did not have the capacity to be aware of what colleagues are doing:

> *One can talk about it [research integrity], but I think that there is so much work in writing applications, and when you get the data, you make sure that you follow the rules yourself, but you do not have the energy to care about what your colleagues are doing. Or, producing standards, because it takes such a lot of time. Therefore, in the end, it kind of turns out that you cannot be bothered doing anything about it*
>
> *Norwegian mid-level researcher*

Another researcher felt that it was more important to devote time to doing actual research and that research integrity discussions should be a focus at the beginning of one's research career:

> *Actually, I need more time to do the actual research… I do not feel like one should devote too much time to it [discussing research integrity]. It should be a part of one's introduction to working as a researcher, and then it should be made explicit: what is research integrity?*
>
> *Norwegian senior researcher*

Finally, one of the UK junior researchers thought that research integrity was not discussed much because it is not a 'hot-topic':

> *…I don't feel it's kind of like a buzzword like impact is at the moment. Which is perhaps kind of a bit of a problem…*
>
> *UK junior researcher*

4.6.2 Productive discussions

As well as discussions about research integrity being perceived as limited and difficult, some participants reported having productive discussions about research integrity and provided some insight in to what facilitates these. One Norwegian participant stated that research integrity was spoken about just like any other research topic, however, this perception was not commonly held by other participants (see above):

> *Yes, I would say so. I just want to say that, yes, I mean, it is discussed just like any other topic. At least where I work*
>
> *Norwegian research administrator*

A UK junior researcher thought that in the field of statistics, there is a growing awareness and interest in methodological issues, which he thought had some overlap with research integrity issues, but are not labelled as such:

> *…it's a growing awareness, at least amongst some about how we do statistics, well we draw far too strong conclusions from conventional statistics and I think that's definitely something I have a lot of discussions about in practice. Also aware that that is with people that are interested in that, it doesn't necessarily mean that everyone that uses statistics is also doing anything about this, if that makes sense. That's definitely something where a conversation is happening. We don't talk about it as research integrity, but I think it's definitely part of it."*
>
> *UK junior researcher*

Familiarity was identified by some participants as a barrier to discussing research integrity (see above). However, for others, discussing research integrity with a close colleague was more productive because they felt comfortable discussing more specific concerns. It was thought that without familiarity, discussions could remain de-contextualised or superficial:

> *Yeah, I mean in my case that [discussion about integrity] would be [with] a close colleague. I mean, not necessarily a friend but if someone close- and then I think you discuss when it just happens something to you or something to someone that you know of because otherwise discussion remains superficial if you don't know the… context of what happened…*
>
> *UK mid-level researcher*

Furthermore, a Norwegian senior researcher thought that when working with colleagues, it is better to have discussions about specific issues regarding work rather than abstracted discussions:

> *… discussions about integrity should be raised in the drafts we are working on, rather than in an abstract form. So that it becomes concrete.*
>
> *Norwegian senior researcher*

It was recognised that collegial discussions could be supportive offering help and advice to resolve issues for individuals experiencing problems, particularly concerning social aspects of research integrity:

> *Well I would say it does come up in conversation. It's usually because the injured party is involved in the conversation. It's not really a case of someone comes in and says, you know, should I do this experiment once or should I do it three times, and it's more if people think that they had an idea and someone ran with it or some of the work got held up that- certainly there are in my field various people*

who will actually chat about it and say well here is what I would do and here is how I would go about it.

UK mid-level researcher

Indeed, several participants reported that discussions specifically about research integrity occur sometimes, and that this tended to be when problems or interesting points of discussion arise such as an extreme case:

But other than that, concerning how one communicates on a day-to-day basis… I do not have the impression that one talks about it daily, but one does communicate well about it when problems emerge I think

Norwegian junior researcher

Not hugely in my experience but it pops up at- it's the more drastic cases that are being discussed, it's not really- well I guess (pause) I mean sometimes things pop up in the peer review system I suppose, people discuss things of where they thought their reviewers were being unfair…

UK senior researcher

...maybe it does come up in conversation, but you wouldn't like sit down with a coffee and be like: 'So who wants to talk about integrity and research'-

(Group laughter)

Yeah, but I feel like I've had sort of conversations on that theme before… I've definitely talked about what if, you know, it's just a big mistake in some of these papers and you kind of rely on as like fundamental bits of like the literature review you've done so, yeah, I mean I've had the conversation, sure, probably don't talk about it as much as say what I'm having for lunch but, yeah.

UK junior researcher

With respect to commissioned research in Norway (where researchers compete for commercial research work on the open market), one Norwegian senior research highlighted that leaders are influential, in whether discussions about integrity issues are productive or not, implying that good leaders are those who take research integrity seriously:

We discuss this. However, it varies a lot with what leadership you have at the time, when it comes to how much attention your concerns receive. Some leaders will put a lot of pressure on you to apply for almost any possibilities for funding, while others have views that overlap with my own

Norwegian senior researcher

Finally, another Norwegian researcher thought that opportunities for productive discussions about research integrity were increased if researchers are part of a relevant committee or group:

> *There is more if you get a special position I guess. Being on a committee or becoming a representative for the union, where one looks at these kind of things*
>
> *Norwegian mid-level researcher*

Summary

Many participants found research integrity hard to define: definitions of what it is not, research and researcher integrity, disciplinary and cultural differences. Talk of research integrity identified three aspects: methodological: good research methods, social: treating people with respect and doing socially valuable research, personal: being a good, honest person and adhering to ethical guidelines and rules, despite pressures and even when no-one is watching.

UK research governance advisors thought that research integrity is important for maintaining trust in research, legitimising research and meeting requirements of funders and publishers.

Research integrity is somewhat discussed amongst researchers in the workplace, but discussions can be difficult because it can be a sensitive and challenging topic which can be exacerbated by barriers such as academic hierarchies, familiarity and distance between researchers. Researchers reported that discussions about research integrity tend to occur in response to problems or points of interest such as extreme cases of misconduct rather than being an everyday occurrence. Familiarity and collegiality are important factors for some in facilitating meaningful rather than superficial discussions about research integrity, where colleagues can be a source of support and advice.

5. Barriers or challenges to research integrity

Overview

Participants' perceptions about things that they view as barriers or challenges to research integrity was explored in all focus groups. The data were organised into five themes: systemic problems, pressures of the academic work environment, problems with research culture, conflicts of interest and accessibility and translation of policies. These findings are compatible with results from a study examining research culture, conducted by the Nuffield Council on Bioethics. Nuffield found that competition (for funding, for jobs and promotions, and in making discoveries and gaining peer recognition) was very high. High competition was thought to lead to poor quality research practices, less collaboration, and reward for self-promoters (rather than quieter, more modest research producing higher quality work) (Nuffield Council on Bioethics, 2014). The report from Nuffield also showed that scarce funding was thought to have a negative effect on research, for example by encouraging researchers to tailor their research to suit funders, thus stifling creativity. Funding shortages were also thought to lead to 'short-termism', affecting employment contracts of researchers, and restricting long-term aims of research. The project also highlighted problems with the ways in which research is assessed (journal metrics, wider professional activities of researchers, peer review, REF (the UK's Research Exercise Framework) (Nuffield Council on Bioethics, 2014). "The view was expressed that high levels of competition for scarce resources put scientists under immense pressure which means that scientists are "bound to behave less well"." (Nuffield Council on Bioethics, 2014, p.30). Many of these pressures were reported by the participants of the PRINTEGER focus groups too.

5.1 Systemic problems

In all the focus groups there was a strong feeling that the current research systems present barriers and challenges to research integrity that are influential to behaviours of researchers working within the system. Indeed, these views can be seen in the discussions that participants had about misconduct and poor research. There was a belief that research has become increasingly commercialised and industrialised that have led to a number of problems in terms of research funding and evaluation and incentive structures for researchers.

Funding issues

One problem with funding specifically raised as a challenge to research integrity by Estonian junior researchers but also identified as an issue in focus groups from the other countries was that funders have specific interests in research (also see conflict of interests below). It was thought that a decline in public investment in research and increases in commercial financing of research will challenge research integrity as researchers have to negotiate with commercial agendas of funders:

> *Then things will go grey in science as soon as there is no public funding. Funding is never quite anonymous, there are always people who decide on the financing matters. The other thing is, where the norm is commercial financing. Let's give an example, like the pharmaceutical industry, here is the same topic, if an experiment gave a result or not, whether we publish it, whether we give the competitor an advantage, so that they will not go to study the same thing or not. So it is the same thing that the scientist in that case is caught in a trap in this economic or game theory, whether certain results are published, how they are published, depends to certain extent on the commercial interest of the financers of the research.*
>
> *Estonian junior researcher*

However, it was also recognised that public money is not a neutral source of funding either. Public agencies also have research agendas that may be driven by particular interests:

> *Well, public money also directs. You will not be given public money unless you have written your project and there are some people who evaluate whether it is scientifically important or not.*
>
> *Estonian junior researcher*

During this discussion, between the Estonian junior researchers, one individual thought that social sciences may be protected from the influence of private funders because it was thought that social sciences are less likely to receive commercial funding for research:

> *I wanted to come back to this private and public money for a second, that the social sciences are in some sense protected from the private money because they produce so little that would be economically beneficial, so that the private money does not really flow there.*
>
> *Estonian junior researcher*

Moreover, it was thought that Estonia perhaps had less commercially funded research than other countries:

> *Well in Estonia there is not… in Estonia with private money, let's say so, that there is relatively little research funded by private sector compared to the rest of the world.*
>
> *Estonian junior researcher*

Another issue with funding that was discussed by Estonian mid-level researchers was that there can be insecurities, due to lack of funds to pay for research staff or lack of certainty that funding will continue, exemplified in the exchange below:

> *- There is very simple, very simple thing, I'm thinking about a doctoral student right now, I simply cannot pay him, no matter how much I would like to, I have two researchers with whom I also have a problem, because my project has only a 0.1 position for his salary, and then there is some inconsistency with the Estonian Research Council that people can work with [minimum] 0.5 position in a project, in a word, it is a total headache that the project money is so small that you are basically starving these people, that I have a personal research grant…*
>
> *- I could not complain about the lack of money, I think there is enough, the worry is that what is lacking is the feeling of certainty that the money will last…*
>
> *Estonian mid-level researchers*

Finally, Norwegian senior researchers discussed how funders (it is reported that the EU and EEA were specifically mentioned), can be inflexible, making it hard to move away from initial plan and adapt research methods to suit the needs of the project. In an example provided illustrated how this inflexibility can have implications for research ethics, but can also pose limitations upon research findings:

> *I think that with regards to research ethics, it is problematic because that one of the reasons that one wants to make changes to projects is that often one finds that the way one is collecting data is not working because of research ethical problems. In our project we were supposed to conduct interviews in groups about a topic that turned out to be more sensitive than we had anticipated, and people wanted to be interviewed, but they wanted to be interviewed alone. Right, and then we find ourselves in a huge dilemma because we are forced to do interviews in groups. In the end, we were allowed to do the interviews in groups of two, but still this is not what… it was not a good solution. And we did not manage to bring to the surface what people really wanted to talk about.*
>
> *Norwegian senior researcher*

Evaluation

The evaluation system was reported as a problem in many focus groups, spanning all four countries and participant groups. Here it was thought that quantified evaluation of researchers leads to an emphasis on researchers maximising publications, placing pressures on researcher to write papers and conduct peer reviews. This was thought by participants to encourage acts of misconduct and certain questionable research practices, such as self-plagiarism/salami-slicing and drive down quality in research, in favour of quantity (see section 3). Thus, systems of evaluation were viewed as influential to shaping practices of researchers:

> *when they started to measure science, well, they tried to make indices, today the WOS articles and Scopus and such things then in my opinion it also started to create distortions in scientific activity. I can understand that if you want to get something, you have to measure it, but the management theory says also that you get what you measure, and if your criteria for performance is how many articles indexed in Web of Science you get from a grant or a research project, then you will get articles and perhaps less real substance. In my opinion this creates distortions both in the research itself and in the application for grants; who is more skilful and who has better contacts in getting such articles has a greater chance to get these grants and resources.*
>
> *Estonian mid-level researcher*

There was also criticism that evaluative mechanisms can be unfair when comparing between disciplines, but it was acknowledged that qualitative differences between disciplines can be difficult to quantify:

> *I think the scientific community who themselves for the most part evaluate the projects, can very well understand the problem [of the inherent qualitative differences between the disciplines that are difficult to quantify]. The question is rather how to do it fairly. For me it seems, within scientific disciplines it is starting find a balance with the new rules, it is checked what the person has really done, and the bigger players do not even show those little authorships, they go out with real articles that they have written themselves. But for me the bigger problem is in comparison between the disciplines… the humanities researchers have always said that it is unjust, my both parents are in humanities, I know very well these things, I admit it is not really fair.*
>
> *Estonian senior researcher*

Nevertheless, there was also some recognition that current systems of evaluation, despite being imperfect, are an improvement on previous systems (indeed, lack of better systems of evaluation were also spoken about by Estonian participants (see section 3.5)):

> *the Italian Academic system have been founded for several decades on the arbitrariness; there were not any quantitative criteria and what the commission decided was law. Although the impact factor, the h index are not perfect, if used with caution they are better than the total arbitrariness*
>
> *Italian research manager*

Participants from all four countries also identified some problems with peer-to-peer evaluation (also see country specific concerns in Estonia and Norway below). It was suggested in the Italian and UK mid-level researcher focus groups that the 'double-blind' peer review system did not really work. This is because disciplinary networks can be quite small so that researchers are able to identify one another through writing style and areas of expertise:

> *It [double blind peer review] is fake blind, [reviewers know] who studies what.*

Italian mid-level researcher

However, 'anonymity' in peer-review was criticised by some Italian participants as leading to poorer quality reviews because researchers can hide behind the vail of anonymity. Indeed, one UK senior researcher stated that he refuses to conduct anonymous peer-reviews. He thought that this improved the quality of his reviewing, although he did not recommend this for junior researchers. Implicit in this was the view that junior researchers are vulnerable in the system of academic hierarchies, presumably because they do not have the experience or status to critique peers without consequence:

> *That's an area where my practice has changed actually but not in a way that I would recommend for early career researchers which is that I do my fair share of reviewing and I now insist that my reviews are signed by me and that the editor passes that on to the authors, 'cos I- personally I think it keeps me honest more than anything else, absolutely know that my name will be attached to my comments and that name will be seen by the authors and I would definitely not recommend that for an early career researcher, that's something you can do once you're established but you could really get into trouble…*

UK senior researcher

A problem identified with publishing bias (in addition to difficulties in publishing negative results), that was also raised in discussions of misconduct and questionable research practices (section 3), is that reviewers and editors can act to further their own interests by blocking publications. Here, Italian and UK mid-level researchers discussed how the publication system can act to favour certain topics, rather than reviewing work on the basis of quality. It was thought that this posed a challenge to research integrity because publications should be judged on quality rather than topic:

> *…at first, I would say maybe before the negative results get published in, talking about editorial decision, its- I mean there is this tendency of publishing what is cool at editorial level… I mean it's becoming a culture now so I mean that's what has to change and so and this comes down to the quality but who judges the quality? It's us so we are the judge of the quality… [so is] our research integrity… such that when we judge, you know, even as editors of a journal, are we actually judging really the science or there are other decisions that we make as we judge a particular article?"*

UK mid-level researcher

Incentives

Evident from the discussions across all countries and participant groups was that many participants perceived that the incentive structure of the research system diverges with the methodological principles of doing good science leaving researchers in a difficult situation, having to negotiate a position between these two competing forces:

> *But I wanted to add that in my opinion this is a very important point and actually a very deep crisis, in this sense that from one side the scientist should be with as good competence as possible, to pass [the knowledge] on as well as possible, to advance the knowledge he has in his discipline. On the other hand, as we function in the social system, which is, let's say liberalist, where we all have to be*

> *salesmen, then in this sense we have to translate the same knowledge into language, or formulate it in a way to be attractive, that it will sell, attract attention, and between these two forces in a person there can probably quite a big conflict. One example where it can express itself, is how sure you have to be in yourself before you disclose the results of your research, the business model and business logic says that the sooner the better, otherwise somebody can beat you to it, and from the other hand the more you publish, the more you show that you have something new, the bigger chance you have to get a better funding. The scientific logic would say that you have to be really sure before, and on this dimension, where does everybody position themselves, this is also an ethical question, but these two forces are in very big conflict in my opinion.*
>
> *Estonian mid-level researcher*

As described in section 3, participants thought that the system can act to incentivise researchers commit misconduct or QRPs, thus shaping the behaviour and practices with implications that can be damaging for science. One of the UK senior researchers identified this problem by discussing the bias of publisher towards positive research findings. This bias was thought to incentivise researchers to manipulate results or distort interpretation of research findings to make them more publishable. Furthermore, a lack of interest by publishers in publishing replications was thought to deter accuracy in research because there are fewer incentives for researcher to replicate each other's work. Thus, incentive structures in the system were highlighted as an important consideration when thinking about challenges to research integrity because of the implications for the ways in which research is practiced:

> *…the incentives structures are not necessarily aligned in a way that encourages research integrity, you know, that it's much easier to get a positive result published than a negative one so (laughs) so you were looking for some effect and thanks to a bit of data that can possibly be ignored for some slightly dodgy reason that you're not quite getting the feedback that you want you ignore those data points for some slightly spurious reasons you would… I mean one of the leading journals (names journals) refuses to publish replications but its 'cos they're not as interesting but if that's the case then there aren't even external pressures on people's- yeah, 'cos if you think it's unlikely that anybody's going to try and repeat my research, then there are fewer incentives to carry it out right in the first place, so I think one of the areas its relevant is just what the incentive structures are in various bits of science.*
>
> *UK senior researcher*

An overwhelming view amongst participants was that researchers are incentivised to publish due to current evaluation systems that favour quantity of publications. It was recognised that researchers need to work to survive, and that it can be easier for individuals to just go along with the system to protect their employment (particularly where this is tenuous). This highlights how factors in the system affects can also converge to affect practice:

> *It is very tempting to just churn out publications, because I need food next year too. It is as simple as that. And it is this way because of the way research is financed and organized*

Norwegian junior researcher

Moreover, a Norwegian junior researcher thought that the publication system can also restrict innovation in research through publishing within accepted paradigms, effectively incentivising researchers to work within parameters of accepted paradigms, which was thought to potentially lead to bad research through lack of development of new methods, demonstrating how incentives can also shape and influence the direction of scientific progress:

> *but if one is to think grimly, or grandiosely, about it, then one might think that the fact the one is supposed to adjust to journals, and their small and large demands, might lead to bad research as a result. Like one of my colleagues, who does research in a field where everybody agrees that they have found a method that is "the correct one".*

Norwegian junior researcher

The recognition of how the system is influential in shaping the future practices of research work was also explored by Estonian mid-level researchers who had negative predictions about the future of scientific practices and abilities of researchers. Furthermore, it was thought that reflection about future practices should be part of evaluating the impact of the system as well as 'grey areas' of behaviour that attempt to manipulate it:

> *If we project this to a timeline, then, after a few decades, we will have only professors who cannot write monographs, some kind of practice changes. Some important scientific practices change, although according to the rules it is all very much allowed. Well, in that sense, well, it seems to me that an important point is that if there is some kind of grey area, then when we think what is the result, in the sense of what we are going to do differently? How does the practice change? And it seems to me, that those things where the manipulation of the system would be safe, there really are not that many, that these are all things that later somehow, well influence us sadly.*

Estonian mid-level researcher

Communicating errata and retractions

Problems with communicating errata and retractions in published research was an issue that was discussed in relation to dealing with misconduct (see section 3.5) and also identified in by a UK junior researcher as a barrier to research integrity. Here, it was thought that researchers may not be aware if errata or retractions have been made to papers already gathered in a reference library:

> *It's tricky as well picking up stuff that is now thought to be wrong because you see errata published every so often, corrections or retractions but you might have something that you've downloaded three years ago and you don't know that someone's corrected something in it and you have a massive reference library and you just go back to that and it's difficult to spot if something gets a correction or if they've published something else that disagrees with it, if you haven't completely kept up with that part of the field, it's difficult to know that that's happened.*

UK junior researcher

Systemic global inequalities

Finally, global inequalities in research system were highlighted by some Estonian and Italian researchers. Here it was believed that researchers from some countries receive greater recognition than those from others:

> *What is still bothering me, is related to citing. When an Estonian philologist has found out something… then some German has cited them and then this knowledge will go to the world as the knowledge of the English or the German…. Nobody will know our Estonian author.*
>
> *Estonian senior researcher*

Furthermore, it was believed that manuscripts and grant proposals were subject to being unfairly judged according to bias regarding institutions:

> *Sometimes [inequality] is not only in citing, but also in grant applications and article manuscripts, it has been tried to send out the exactly identical manuscript to with different institutional authorship and there are very big differences. This is called the post-code effect, zip-code effect. That if you send the manuscript from [Estonian University] or Harvard, there is a very different probability to get accepted.*
>
> *Estonian senior researcher*

Reported country specific problems

Estonia

There were some very strong views from Estonian mid-level researchers that the evaluation of research for grants in Estonia is problematic because it is underfunded and subsequently superficial. It was believed that the system required improvement. Furthermore, the system for categorising publications in Estonia was said to not correspond with other countries which was thought to be detrimental to Estonian researchers because it incentivises certain types of publications:

> *How our Estonian Research Council evaluates, a good example, in fact an international joke… a good example of how superficial the process of reviewing [for grants] is…The entire system is rotten in Estonia, similarly as the categorization of our publications. I cannot send the same CV to the West because in my field nobody understands what the 1.1 or 1.2 or 3.2 stand for… There is a very serious fault, especially in Estonia.*
>
> *Estonian mid-level researcher*

> *-My bigger concern is that in England and America… the books are most important, not 1.1, and here in Estonia I do not feel any support, if I want to write a book, the 1.1. and 1.2 are so annoying. But what really has influence and what I want to write, is books, but this needs time and support, and from outside when we read about some professor or researcher, we look for the titles of the books, not their 48 1.1 articles.*
>
> *- Absolutely true – it is the same in social sciences, in UK, England, Germany books count, not articles.*

Estonian mid-level researcher

Disciplinary priorities in funding were also identified as a problem for small countries like Estonia. It was thought that the system can be particularly damaging to disciplines that are not prioritised in funding, which may not be sustainable compared to in larger countries like the UK:

> *- I think when if the state sets priorities, or even at the university there are attempts to… list the [priority] disciplines… When we are evaluated as scientists, it is, it is a bit difficult.*
>
> *- But I think we have a very specific problem and it is that our country is small and there are few people. In many big countries the different schools of thought can be viable. In UK there is always a university that works on the topic, but in our case, it is often the case of being or not being.*

Estonian senior researchers

In an exchange by Estonian junior researchers, it was evident that research conducted was expected to both have impact and global relevance, but also that it supports the preservation of Estonian language and culture, presenting particular challenges for Estonian researchers to meet conflicting ideals:

> *- It [research] has an impact factor and it contributes to the preservation of Estonian language and culture and so on, right.*
>
> *- Well, the question of directing and answering current needs. I have the feeling that the current situation rather inhibits studying something eternally important, because still, [the requirements are] if it contributes to economic growth, does it contribute to the preservation of the Estonian language and culture, these are the keywords that help you to…*
>
> *- And then afterwards, it will be asked in the media if a lecture in English lecture will contribute to the preservation of language and culture.*
>
> *- Well, yes, exactly. Maybe, let's do world-class science, but let's do it in Estonian.*

Estonian junior researchers

Finally, Estonian junior researchers discussed the implications of Estonia being a small country on research. It was thought that the small, close-knit research community in Estonia was a challenge to research integrity because it makes it difficult for systems of evaluation to be objective, leading to the potential for bias:

> *- Estonia is so small, that means everyone knows everyone.*
>
> *- Yes.*
>
> *- If you submit an application, surely those who evaluate you, you might not know who they are but surely, they know very well who you are.*

- They know your supervisor or his wife or whatever.

- Is the money coming from Europe better than Estonian money?

[Laughter]

- Probably, the money, the more anonymous and farther away, the more likely the preferences of particular individuals have less chance to influence it ...

Estonian junior researchers

Norway

Like Estonia, the small size of Norway was highlighted as potentially problematic for objectivity in evaluation and a recipe for nepotism that can be damaging to researchers as well as challenging research integrity:

> *Because there is in Norway, which is such a small nation, things are incredibly intimate. Everybody knows each other, and I almost want to say that half of them are related to each other. So, when it comes to, kind of, when one is supposed to maintain wisdom, be an examiner, and give each other peer-review and so on, even though one is supposes to be independent an all that then… That is impossible in these tiny academic communities. And this is a typical Norwegian challenge. Then I am thinking that you have opportunities for both cronyism, and also the opposite in tiny fields. I know a person who put their career on ice until a person retired. Then he started working there*

Norwegian research administrator

Another issue raised that was specific to the Norwegian mid-level researchers focus group was that there can be difficulties in accessing the wealth of data held in national datasets to utilise for research:

> *Research on data registries is incredibly complicated in this country, taking into account how good the registries are. Many give up underway, because it can take 3 – 4 years to get permissions.*

Norwegian mid-level researcher

It was also thought that levels of competency amongst staff at these data registries can be low, making them inconsistent to deal with and unhelpful for researchers. These difficulties of access and competency were viewed as hindering research and therefore barriers to research integrity:

> *[About the Norwegian Centre for Research Data] through the years I have experienced varying practices from them. One project was approved, another way rejected, and it was very arbitrary. I have experienced pretty low competence there, in several different situations. Several times, I have experienced that they are not at all helpful, which they are supposed to be… I think what is most important is to get more competence in there.*

Norwegian mid-level researcher

However, some specific incidents relating to research ethics were also identified indicating that sometimes the actions of data registries can be ethically problematic in terms of protecting individuals (research participants). One incident reported arose from demands of data registry that were deemed unethical by the researchers. This was very challenging for researchers, posing a research integrity dilemma that required careful negotiation with the agency:

> *And we have been working on this for two years. Getting permissions, and now we finally got them from Datatilsynet [the Data protection agency]. We have been through all instances. What Datatilsynet demanded was that we informed those we read about in [the data, which was very sensitive]. For us this was a completely unreasonable research ethical demand, which related to our integrity in a way. Because informing [the people in the documents] could trigger, one can imagine, a lot of trouble. Therefore, if Datatilsynet upheld this demand, that we inform the parties […], it would be completely… Research ethically, for us completely unreasonable. We would have dropped the project. Because it was research ethically impossible.*
>
> *Norwegian mid-level researcher*

Whilst difficulties in accessing data sets are probably not unique to Norway, they were not prominent in discussions of other countries.

Italy

It was reported in the Italian research manager focus group that nepotism in the research system was identified as a problem in Italy. However, no further elaboration on the causes of this was given, and there are no direct quotations as evidence for this.

Another issue identified as problematic and potentially leading misconduct or bad practices identified by an Italian research manager is *"continuous legislative or regulatory change".* This was described as leading to *"a continuous, alluvial overlap of norms",* where researchers may develop bad practices from quickly adapting to changes. It was not clear whether this problem was viewed as something specific to Italy or a wider issue facing other countries, but this problem was not identified in focus groups outside of Italy.

Italian junior and senior researchers highlighted that researchers and research groups within departments are subject to quantitative evaluation by the institution to allocate resources and doctoral positions, and this was thought to pose a challenge to research integrity. Presumably this method of resource allocation was thought to echo the problems attributed to quantified evaluation in the wider research system:

> *We have an algorithm that, based on how much a research group has published or how much high the impact factor of the research is...there is an algorithm that automatically gives square meters and desks that the research groups have the right to have in the building.*
>
> *Italian junior researcher*

Finally, Italian junior researchers also highlighted that the system of qualifying for promotion: 'Abilitazione Scientifica Nazionale' (National system of scientific qualification), enabling researchers to progress to associate professor and professor roles, focusses on first authorship. It was reported

that this can lead to researchers being *"obliged"* to take first authorship to meet the requirements of this qualification, preventing research groups following an internal rule of allowing PhD students first authorship. There is no direct quotation to fully evidence and describe this issue in full, but it is reported that one participant described this situation as a systemic issue that was unfair:

> *This [promotion rule] is not fair but it is something that is determined by the system*
>
> *Italian junior researcher*

UK

The UK Research Excellence Framework (REF) was identified as a particular problem by UK senior and mid-level researchers. This system allocates funding to UK universities using quantitative evaluation criteria, assessing 'impact' of research. It was thought that this system fails to measure *"things that really matter"* and incentivises publications, leading to pressures to publish and a proliferation of academic journals, echoing earlier arguments that the emphasis on quantity in research is potentially at the detriment to research quality:

> *I guess the problem with the REF as we see it is they've actually focussed on the surrogates endpoints, the things they can measure, and not made an attempt to really get underneath that and look at things that really matter. So naturally as we've been judged on the quality and the quantity of our publications, the number of journals has expanded massively because everyone now needs to publish but it's not to say that the increase in publications demonstrates that we're all doing better research, you know, or we're doing the same quality of research but more quantity which would also be a good outcome, it hasn't worked like that.*
>
> *UK senior researcher*

Certainly, it was thought that evaluators should look to other criteria to measure success in research, but changing the current system was perceived to be difficult:

> *…the pressures from REF, from getting the highest impact factor, all of these impact integrity... holders of the keys of publishing and grants and the rest of it should be made aware of, they should, they should look at other metrics, not just impact but it's very difficult to change this.*
>
> *UK mid-level researcher*

The UK research governance advisor focus group were able to provide a unique perspective due to their roles within UK institutions. They highlighted that whilst UK institutions talk a lot about research integrity, they do not necessarily support this with adequate resources. This issue was not mentioned in any other focus groups, so it is not clear whether this problem is something that is specific to the UK or also exists in other countries:

> *This is more anecdotal and maybe partly opinion but it's a hell a lot of universities, I think institutions pay too much lip service to research integrity but without say properly resourcing it. A lot of universities are now wanting free student numbers for example, that's putting more burden on professional services staff who process research ethics applications, it increases timescales and it'll almost*

sometimes be like something has to go wrong before-… And I think that can be a barrier personally.

UK research governance advisor

It was thought that the lack of resources can be a barrier to research integrity, rendering institutional responses to issues as reactive rather than preventative, demonstrated by this following exchange between two participants:

-It can 'cos your resources- it pulls in so many different areas and if there's an issue in other area of the university that's happened that's just where the attention and resources go-

-Reactive isn't it?

-Very much, very much reactive.

UK research governance advisors

5.2 Pressures of the academic work environment

As described above, the participants thought that the current research system places certain pressures on the everyday work of researchers:

…now it's become this industry, so it's become this industry so there's a huge publishing industry and then there's another drive to open data and open research and open publishing and there are all these pressures and the researchers are at the centre of all these pressures…

UK senior researcher

Whist some researchers thought that a bit of pressure in the academic environment can be a good thing. It was thought by some that when pressures become too great, people start cutting corners, which is a challenge to research integrity:

… I am not negative to there being some pressure in a knowledge-producing institution. There should be, and we need to publish our work. But that pressure should not be so strong that it breaks you or make somebody take shortcuts

Norwegian senior researcher

The view that pressures can lead to people taking shortcuts is also evident in discussions about misconduct and poor research (section 3), where participants thought that researchers can resort to questionable research practices to cope with the demands of the academic environment. Indeed, one UK mid-level researcher thought that misconduct and QRPs will increase with the more targets that are set for researchers:

…we're talking about people in that [research] system, they have all of these pressures and some people think I have to do something, I have to get on the ladder somehow and that's what pushes people to do these things, but the more targets are set and the more- I don't think misconduct will go away, that's what I'm trying to say. I think it will increase.

UK mid-level researcher

Pressures to publish

As described above, participants believed that current evaluation and incentive systems in academic research reward researchers who publish widely. Therefore, it was not surprising that pressures to publish were highlighted across all focus groups at some point, and were thought to be a big challenge for research integrity because these pressures were believed to motivate acts of misconduct and QRPs (also see section 3):

> *…there is pressure from publication, you know, and putting it in that journal, that journal… I mean I think it's [misconduct/poor practices] driven by the pressure of publishing in high impact journals, I think that's part of the problem.*
>
> *UK mid-level researcher*

Some participants thought that pressures to publish, focus time being spent on publications, leaving researchers less time to work on research:

> *You should have more time for research, there is unbalanced attention [to publications]*
>
> *Italian junior researcher*

Indeed, UK junior researchers discussed how mistakes are inevitable because of the pressures to meet publishing demands and deadlines:

> *-There's always going to be deadlines and you're going to have put in a paper and you're always putting in a bit more work but if you did that and there was kind of a very accepted to admit ok, here's a mistake or here's a something-*
>
> *-Do you mean later on, after it had been published or something?*
>
> *-Yes. Maybe just because I feel like mistakes are going to be inevitable, there's always going to be too much pressure.*
>
> *- Yeah.*
>
> *UK junior researchers*

The UK junior researchers also reflected that there was a stigma of correcting honest mistakes in published work which can be challenging for researchers:

> *-I mean I've got a paper and I know there's like two mistakes that won't affect the conclusions really… and like- do I like send in a correction for that, it's not really the important part of the research, we're focussing on something else but there's like these little small things are there and like if I send in a correction for that its really long, I don't really know how to do it, will people then look at the paper and think ah, no-*
>
> *-Disregard it (inaudible)-*
>
> *-Yes. I don't know.*
>
> *UK junior researchers*

Time and workload

Time was another pressure of academic work that raised in many discussions. As described earlier (section 4) some researchers thought that there is not really time to discuss research integrity in their day-to-day work. This means that research integrity is not an issue that is prioritised, even though some researchers found talking about it as part of this research interesting:

> *But to make seminars about it [research integrity] … My experience is that not many attend. One does not prioritize it, and do not have much time for it.*
>
> *Norwegian mid-level researcher*

> *Well, time is… Think for example about collegiality, actually having time for example in the section to raise these questions [about integrity], I would like that. There is no time for that, right? There is no time for having a proper discussion like we have had here, a two-hour talk where we reflect about our experiences, viewpoints*
>
> *Norwegian senior researcher*

Time pressures combined with workload were identified as an issue for academic researchers where they may have teaching and administrative tasks such as obtaining ethical approvals for their research, which can take up valuable research time and can be perceived by researchers as a barrier to them getting on with doing the research:

> *-I think it's the time issue-*
>
> *(general agreement)*
>
> *-They're already stretched with the other responsibilities with teaching and things like that and it ekes out the research process so much with all of the admin associated with getting approvals and things… its still- its invaluable and it's a really important thing to do but they see it as a big outlay*
>
> *UK research governance advisor*

> *I do still think they perceive that [the research ethics process] as a real barrier to them just being able to get on with their research…*
>
> *UK research governance advisor*

Pressures from obtaining research ethics approvals were viewed as particularly high for students in the UK, who have limited time to complete research tasks, although this process was also viewed as an important learning process by the UK research governance advisors:

> *I think it's important if we try and tap into our student community now 'cos these are our future researchers who are going to have to go through this process, they have a completely different experience to what an academic goes through. They're going through a research ethics review for the first time for example, they*

> *are often under tighter deadlines because they have dissertations to hand in and they need to get their ethics review undertaken quite quickly but of course it should be a bit of a learning experience for them as well*
>
> *UK research governance advisor*

One of the UK junior researchers reflected on how he had been told by senior researchers that time was an important factor in developing good, successful research collaborations, which can be difficult to set up, but can produce quality research outputs:

> *I've been told by, you know, older professors but some of the best results for them, the most productive things they've worked on have been these cross-disciplinary things and well they've been hard and taken a long time…*
>
> *UK junior researcher*

Time pressures combined with pressures to publish was an issue identified as a challenge to research integrity by Italian junior researchers as well as Estonian and UK focus groups. This combination of pressures was thought to be particularly challenging because it was thought that they contribute to lowering quality research outputs. Here, researchers are incentivised to publish in large quantities and therefore do not have the time to devote to developing research ideas to their full potential:

> *The point where science can turn less good… is exactly that that in this collective scientific competition there is no time for just being on your own and certain original ideas either do not emerge or you will not realise them. I have this way, many things that I am really interested in, stay on the shelf for years, because you have to do some [publications]… all the time.*
>
> *Estonian senior researchers*

Moreover, it was thought that the combination of these pressures led to researchers operating according to the rules of the system to publish in large quantities, to the detriment of producing larger, more substantiated pieces of work. This issue is exemplified in the following exchange between Estonian senior researchers:

> *- in our case [humanities] important things can be left unstudied, because you have to play by those rules. Publish in places where there are no interested and knowledgeable readers and do all the time new things instead of finishing something off properly.*
>
> *-Exactly, e.g. books. Out of the question. We will write books when we retire.*
>
> *Estonian senior researchers*

Some of the UK junior researchers raised a concern that senior researchers can develop knowledge gaps as they progress in their career because they do not have the time to keep up-to-date on certain areas. This was thought to be a problem where researchers are not aware of these gaps which can affect the quality of research:

> *[senior researchers] will work from their own background which was inherently the result of training and was received twenty years ago and not enough- well I've met professors that are very conscious of having a knowledge gap in certain areas, just simply don't have the time to catch up on that so that's also a problem… it's a challenge and it can also sometimes be a risk. Because there's knowledge gaps that you're aware of but there's also gaps that we're not aware of or people are very happy to just do things the way they've been done.*
>
> *UK junior researcher*

UK junior researchers also described pressures of time and publishing leading them to publishing things that although correct, they were not fully happy with:

> *You can definitely find yourself in the position of ok I have this, and this worked well enough that I can get it out. I know it's not perfect, it's not wrong but I could make it better but if I make it better I'll have to delay submitting it for a couple of months and I really can't afford to do that so, yeah, you do have that time pressure.*
>
> *UK junior researcher*

Finally, another challenge posed by lack of time stemmed from short term or temporary research contracts which was identified by participants in Norway and UK junior researcher focus groups. It was highlighted that lack of permanent work conditions for some can make it difficult for researchers, because they have limited time to work on a project and complete research work, putting them under pressure. At the end of this period, they effectively need to move on to new employment:

> *Time constraints, pressures to get things done, you know. A lot of people when they go into a project they are funded for a, you know, a specific amount of time and once it goes beyond that time it's very difficult for them to carry on working on the same project.*
>
> *UK junior researcher*

Peer review

There were some criticisms that peer reviews can be poor quality in Italian focus groups, however, responses by senior researchers in Estonia and the UK gave some insight into the challenges of peer review faced by researchers. In an exchange between Estonian senior researchers, it was highlighted that demand for peer reviews can outstrip or certainly challenge researcher's capacity as research and numbers of publications increase, potentially threatening the quality of reviews. Furthermore, it was highlighted that peer reviews are voluntary, unpaid work completed on top of other work:

> *-I feel, the main problem in the reviewing of articles is the enormously expanded scientific system. We have no China and India, science is bigger…. Now when you are in a grant committee, [you] send them out, or you are the editor, first ten do not accept. And you yourself, you get a plea for review every other day, you cannot review constantly.*

[others nod and agree]

-The same story, yes.

-We feel, what quality comes of that.

-But for me it is a very big problem. And mostly it is totally voluntary…. You do not get any bonus.

Estonian senior researchers

In an exchange between UK senior researchers, the issue of peer review quality was addressed, where one researcher described how pressures of time and workload in their everyday work can mean that they were not always happy with the quality of their review. The other researcher in the discussion stated the importance of making it clear to journal editors if quality is an issue so that this is acknowledged:

- …sometimes I think I'm guilty of that [not producing a high-quality review] because again it's to do with pressures and so much reviewing to be done and sometimes I don't think I'm particularly happy with the quality of my own review but, you know, there's only so many hours in the day and somebody is-

- And presumably you start your review by saying I'm sorry I haven't got more time to devote to this review, but I'll do the best I can. I mean if you're worried about the quality of your review the least you can do is try and downgrade that review in the eyes of the editor compared to other people who may have put more time in.

-Yes.

UK senior researchers

Research collaborations

Research collaborations, particularly across disciplines were another part of academic work that were identified as posing potential challenges to research integrity by UK researchers. A number of issues were highlighted. First, communication between different specialists was highlighted as a potentially problematic area, meaning it can take time to build understanding between collaborators:

With the working across disciplinary areas as well, I can understand the need for the specialists. You could- but I always feel that the problem then you get is communication between the different people 'cos the field that I came from did not have specialists really, everyone does everything and I've come across to a more medical thing and there are statisticians which I thought that's really good and people that can work with the data but then the researchers don't properly know how to tell them the right things and the statisticians don't always communicate in a way that the researcher understands and that can make the process longer and much more difficult for them to get towards what they need so, yeah, there's a balance there.

UK junior researcher

Second, junior researchers working on cross-disciplinary projects may not get overall feedback on their work because people will tend to comment within the boundaries of expertise, potentially leaving room for error:

> *…I work on a project where there's six different people that have expertise in a variety of different areas and they're all very good on commenting on the bit that's most relevant to them, but I know none of them completely know what I've done and that's kind of a problem (laughs) 'cos it might need some feedback. I might have missed something*

UK junior researcher

Third, it was thought that interdisciplinary projects can pose challenges for maintaining methodological integrity and high standards because it can be difficult to judge what practices are best working across disciplines:

> *…in interdisciplinary projects… there is a danger when you work across disciplines of lowering your standards which goes into a little bit of research integrity as we touched upon…you can believe that what you've done, you have achieved something very important but little value on the other side or vice versa, so then that's why it goes into, you know, impacting a bit your research integrity 'cos you want always to produce the best science and then it's hard for you to judge if you're done best, what is best science across disciplines.*

UK mid-level researcher

Finally, it was highlighted that working on interdisciplinary projects can expose researchers to new pressures present in the different disciplines that they are collaborating with, which can challenge integrity:

> *So I think sometimes with interdisciplinary or just cross sub-area collaborations you find yourself under pressures that you're not familiar with, so in my field there is a moderate level of competition but it's nothing insane whereas if you go and work with people in other areas there might be really quite strong competition to be the first ones to publish a result or to be the first ones to publish a structure so then the pressure becomes to really sell your results very well and I think at the extreme of salesmanship some integrity may be sacrificed in those sorts of situations.*

UK mid-level researcher

Vulnerabilities for junior researchers:

Some vulnerabilities were highlighted concerning more junior research staff. As highlighted above, junior researchers are more likely to have vulnerable employment (temporary or fixed term contacts). In addition to this junior staff have subordinate roles in the academic hierarchy (see also section 3). Several participants highlighted that this can mean that researchers early on in their career may not feel able to assert themselves:

> *And it is the same in academia right, that bewildering work positions or vulnerable positions leads to one not being very willing to fight hard for one's case*

Norwegian junior researcher

Some senior researchers also recognised potential vulnerabilities for junior researchers, for example, UK senior researchers discussed this issue in connection with anonymous peer review (see above), but also reflected more generally about modern research work, where employment is more tenuous and competitive, perhaps making the contemporary research environment more difficult for young researchers than it was in their day:

> *I like to think that my day to day work hasn't really changed that much, you know, in the sense of I still look for interesting questions and I try to answer them to the best of my abilities… but then the outside world has completely changed, what they want you to do, you know, and there is this translation step that I think a lot of people are struggling with. Now we are quite comfortable in our permanent position and our professorship and so on but it's much more salient I think for the early researchers and the post-docs who don't know if there's going to be a permanent academic position at the end of their post-doc, yeah, so for them the question becomes much more existential… I don't feel it touches me in the same way it maybe affects some of the younger (inaudible) researchers.*

UK junior researchers pondered whether being expected to be an 'all-rounder' (particularly at PhD level) could pose a challenge for research integrity. It was thought that, at least in some areas (statistics) should be a domain of specialists, statisticians who work with researchers to ensure that the research is methodologically sound:

> *…many people's PhDs consist of doing all aspects of research themselves but then you mention trust and I feel like with the increasing complexity I think a discussion that should be had is whether we should just have specialists on all aspects of the research process, so if you work with complex statistics, sorry I keep coming back to that but that's my favourite preference, why not have an actual statistician do that for you, while you do the research question and I think that happens to some extent but at the same time a lot of research training is still based on the idea that we're supposed to be able to do everything ourselves and I think that's, well I think that's an interesting thing to discuss.*

UK junior researcher

With regard to the pressures to publish, UK junior researchers thought that researchers early on in their career may feel particularly pressured to publish work before it is really ready, because they need to build up publications on their CV. It was thought that this problem could also be exacerbated by the research culture early career researchers are working in:

> *…the pressure to publish, especially when you're a young researcher or relatively young, you want to have lots on your CV so there's an idea to kind of write stuff before you actually maybe feel ready or before you feel sometimes that you've done enough primary research yourself so that kind of culture I think can, yeah,*

mean you're forced to publish work that you feel yourself isn't quite ready maybe sometimes.

UK junior researcher

Finally, UK junior researchers reflected on how time pressures and workload burdens of senior researchers can have a detrimental effect on the work of more junior colleagues. Here, it was highlighted that junior researchers may fail to have their supervision needs met, which has implications for the training of junior researchers and the quality of research conducted:

- …you can do with them [senior researchers] having more time to look on specific projects 'cos the reason they are that senior, they're hugely- very, very useful when they have time to input but they very rarely have time to input so you can get really useful suggestions essentially too late in the process and you go if you'd told me that four months' ago that would have been brilliant-

(group laughter)

-but then it's too late to implement it.

-The fact that senior researchers are stretched too thin also prevents them from being on the top of the game as a supervisor- from a supervising point of view, so like you mentioned a PhD student is an independent researcher, at the same time he or she's going through a learning process being supervised by a professor who may or may not have the appropriate amount of time to give to them…

UK junior researchers

5.3 Problems with research culture

Participants discussed that the wider research system with its modes of evaluation and incentives directly impacts the research cultures of institutions, departments and research groups. One issue that was raised in several focus groups from across all four counties and participant groups was the view that the research system has become more competitive, in turn making the research culture at institutions more competitive. Whilst there were worries about the effects of increased competition on research integrity, several participants also highlighted that competition in the research environment was not wholly negative:

I would think competition, that's an opportunity and a challenge as well…

UK mid-level researcher

However, the main focus of participants regarding competition was the challenges that it poses to research integrity. Participants thought that highly competitive research cultures of institutions or departments can potentially lead to QRPs or poor treatment of people (see section 3 above) as well as altering the research environment at institutions, including the types of academics who flourish:

> *There was talk in the beginning that also the social environment has to be pleasant where you work. Now the rather harsh scientific capitalism, I would call it so, does not favour all types of science, all type of scientists, and this is a big problem in my mind. If we look at the [university], I have seen the disappearance of one type of scientists, and this is, we call them erudites…. Those who know a lot of everything, the scientists with very good synthesising skills, but who are often very good lecturers, and because they do not publish original science so much on an international arena, then such old professors have disappeared… This is for me a very catastrophic trend, that a very clear type of scientist has gained an advantage, and this will have bad fruits, there are very good, but also very bad, and the bad fruits are, I have heard of teaching students this way: do not take notice of the PhD, just write something up, you have some articles, no need to do more than 10 pages [for the cover article]. Let's do something quickly. I do not think this is right.*
>
> *Estonian senior researcher*

Moreover, this view was echoed by a Norwegian research administrator, who thought that growth of individuals working in research has led to increased competition, where those who are most confident in themselves are the ones who are admired (and presumably get ahead):

> *The research population and the research community have never been larger. Clearly, when there are so many competitors out there, at the same time that we have an increase of populism, those who are cocksure appear as the most impressive*
>
> *Norwegian research administrator*

Interestingly, increased competition was perceived by a UK senior researcher as having a detrimental effect upon the research culture of certain disciplinary fields, particularly in areas where the industrial sector is powerful and influential. Here, it was thought that the values in industrial research that focus on completion and commercial interests are being increasingly adopted and are influential upon researchers early in their career. This was viewed as problematic because it was seen to be a change in research culture which contrasts with traditional academic values of collaboration:

> *…in machine learning now the flavour of the day is deep learning and this is being pushed with enormous resources from industry, resources that we can't even hope to have in universities so that it creates its own dynamics, but the leaders in this field are very poor role models because they're all engaging in the same kind of, you know, they're trying to beat each other and be the first to do x, y and z and we actually don't know why it works. This is an area where we are badly in need of theory. Everybody knows, and the field leaders are not engaging in it and that is- I think I'm very worried about what influence that has on the young researchers 'cos that's all they see so at the conferences, the next conference, you know, this year were six thousand people, next year is probably going to be ten thousand people, and they all believe that that's how science is done and its bad because, you know, they don't have the same values, that they are not disinterested, they think it's about beating everybody else and being the first one to- and it's a real problem.*

UK senior researcher

There was a view expressed by some participants that changes in wider culture have become subsumed into research culture, to the detriment of research integrity. For example, a UK mid-level researcher thought that short-term success was prioritised over longer-term goals, which within research culture can lead to people taking shortcuts in their research, leading to low quality results:

> *It's also a culture of being successful in the short, who cares about long-term, so there is a general culture in, and every human behaves sort of nowadays so that has also has been picked up by (laughs) the scientific community so unfortunately so yeah, so there should be ways to minimise that… you know that if you just try to publish things which are not reproducible or the results are not that clear, these are not really going to enhance a career, so maybe it's not really an answer to avoid misconduct but it could be a way to make people focus on what's important science so following the methodology carefully rather than find shortcuts.*

UK mid-level researcher

Indeed, the research environment was viewed as highly influential to research integrity issues. Many participants thought that research culture can be beneficial or act as a barrier and identified a range of factors in the research environment that they viewed as challenging to integrity. One of the UK research governance advisors stated that *"old school*" researchers who value academic freedom may be resistant to policy developments, or those who have not kept up-to-date can be challenging actors who can be influential to the culture of a research group:

> *I think culture's a big issue as well. Now that can be a good thing, or it can be a barrier, I guess it depends on what research environment you're within and of how transparent the team is, and whether you have a supervisor who's willing to kind of hear your concerns or not, so I think culture is a really big potential barrier. If you've got a very kind of 'old school' researcher who really enjoys academic freedom to the nth degree and does their own thing, and unfortunately you do get those in every institution, and you get researchers who've just done something in a particular way for 40 years and you can't really change their view now, with the concordat or with funder terms and conditions or not, they're going to do it their way so I think that's a barrier as well.*

UK research governance advisor

This view of influential actors in research culture was also expressed by an Italian senior researcher, who highlights that this is particularly problematic where these individuals are research heads:

> *Where does the problem arise? When one is in an environment where there is little sensitivity or even the head of the research group has improper attitudes*

Italian senior researcher

Challenging aspects of research culture was something that was discussed at length in the UK mid-level researcher focus group, who identified further factors that could pose barriers to integrity. It

was thought that that the wider attitude of the research team could push individual researchers to violate research integrity:

> *Usually [lapses/misconduct] its again the culture of the laboratory and the culture of the group so in my field in most groups if there are doubts about the quality of somebody's data then it's quite common for a supervisor to say to someone else just see if you can repeat that experiment and how it works for you, but anecdotally again there are groups and the anecdotes are mostly US based that push people into publishing things that they're not certain of so there is that balancing act. So, outputs need to be produced but we also need to preserve essentially people's reputation of being good scientists*

UK mid-level researcher

Indeed, one of the Norwegian junior researchers shared an experience where senior researchers had advised them not to obtain necessary data access approvals because it would pose difficulties in conducting the research:

> *… they [senior researchers] kind of have the attitude that "you should just avoid reporting it" [applying for data access approval], because that just lead to trouble. That is the attitude. This should be scandalous of course*

Norwegian junior researcher

However, a UK mid-level researcher also highlighted that research cultures where researchers work largely on their own, without the support and feedback of other researchers can also pose problems for research integrity in terms of quality of work and use of appropriate methods:

> *it's challenging yourself as a researcher by actually exposing it [your work] to your colleagues and undergoing scrutiny isn't it? Not just in terms of peer review but also in terms of discussing ideas and developing them further and the risk there very much is if you're not in a good environment and you pretty much work on your own then that process of challenge isn't happening*

UK mid-level researcher

Research cultures were also recognised as being influential regarding academic workload and imposition of burdens upon researchers, which as discussed above, were highlighted as challenging to research integrity. A UK mid-level researcher thought that some research environments were not conducive to research, because of pressures and burdens, meaning that researchers can make mistakes or fail to keep watch on the work of students:

> *…sometimes in certain places the environment is not suited to do research and that's what leads to issues with people doing the right thing or the wrong thing. It could be simply the stress of the environment, doings lots of administrative stuff, doing lots of other roles that are- they can't follow the students…*

UK mid-level researcher

Some of the junior researchers spoke about the importance of support by more senior staff in the research environment. For example, a Norwegian junior researcher spoke about an incident where they had not been credited for their work on a commissioned research project in its dissemination online. They had raised this issue with their supervisor who had been disinterested an unsupportive, which disappointed them:

> *I remember that I told my supervisor and said:" Hey, my research findings are published on the webpage of the people who commissioned the research, without crediting or citing me or anything like that." And then the reaction was like:" Yes, whops, that is too bad". But nothing like: alarm! And I found that somewhat disappointing*
>
> *Norwegian junior researcher*

A Norwegian senior researcher also provided an example where they had to deal with a difficult situation alone because the leaders in their research environment would not get involved to help:

> *… nobody in the administration or leadership wanted to get engaged in it. Therefore, I was all alone in trying to clean up the mess, after a PhD-student ran off with the data and quit the PhD-program midways. I never got any information about why, and I never got back the data that I had contributed to collecting*
>
> *Norwegian senior researcher*

A UK junior researcher reflected on how post-PhD, they had less support from their mentor and less access to training. They implied that this lack of on-going training and support in their research environment was not ideal:

> *I think as a post-doc I have less sort of- much less contact with my mentor than I did as a PhD student, so I suppose there's a sense of not getting much feedback on my work. I suppose there's a sense that I should now be independent and work on my own, but I suppose some things might be – could do with- everything could do with being seen by a range of people… …I think also less training. I suppose as a PhD student you get a lot of- you get research, quite specific research training to your area but I feel (inaudible) just kind of- there's nothing really available anymore. It's kind of assumed that you know everything that you should know. There's not kind of ongoing skills refresher courses or anything like that*
>
> *UK junior researcher*

Finally, some participants discussed problems relating to power imbalances in the research environment. It was thought that academic hierarchies could pose challenges to research integrity, resulting in the unfair treatment of people. One Norwegian senior researcher highlighted that those in authority have power over decisions (using the example of authorship), implying that these decisions can be to the detriment of those without authority:

> *I think there is a lot of abuse [in authorship]. The one with the most authority kind of just decides*

Norwegian senior researcher

Furthermore, the term *"boys club"* was used to describe senior management by a participant in the Norwegian junior researcher group, indicating that power imbalances were also perceived to be along gender lines.

It was also reported that participants in the Italian senior researcher group spoke about how power dynamics in research groups can make it difficult for whistleblowing, particularly for junior researchers, because individuals can act to *"to stand in your way"* to hinder careers of those who dare whistleblow.

5.4 Conflicts of interest

Declaring conflicts of interest was highlighted as an important part of being transparent in research in participants earlier discussions regarding definitions of research integrity, and the issue of conflicts of interest also arose with regards to barriers and challenges to research integrity in focus groups from all four countries and participant groups. The vast majority of discussions concerning conflicts of interest focussed around the potential conflicts between research funders and researcher's integrity in conducting and reporting the research, although other issues were also identified.

An Italian junior researcher reportedly stated that it was important to realise that declaring conflicts of interest (e.g. in publications) does not mean that research has invalid findings, highlighting that these declarations should not necessarily cause stigma. However, several discussions highlighted concerns and some incidents where research findings produced by researchers can be subject to the influence of funders. Much of this talk stemmed from the Norwegian focus groups where many researchers were involved in doing a lot of commissioned research. A Norwegian research administrator implied that threats to research integrity were quite common in departments that do commissioned research:

> *When you are at a department that does commissioned research, you do not have to do much searching in order to find some good examples [of breaches of integrity]. And this is related to the relation between the researcher and the one funding the research. Those can sometimes turn sour*

Norwegian research administrator

Participants highlighted how there can be conflicts between research funders interests and researcher objectivity and their responsibility to report accurate findings. An Estonian senior researcher provided the example of nutrition science where the food industry can potentially influence the results of research:

> I just bring an example to illustrate, in medicine it is possible, the most well-known is what goes around nutrition science and there it is clearly possible that the interests of certain food industry are at the front, in which direction certain results are shown, especially if it is a complicated field like nutrition, which consists of so many factors.

Estonian senior researcher

Furthermore, a Norwegian mid-level researcher pondered how researchers may feel subconscious pressures to not go against funders when working in the field of funder driven research, here it was reported that the participant implied that in commercial research work, researchers may feel conflicted because they need to obtain further contracts:

> *I was thinking the relationship between researcher driven research and funder driven research, and to me it would be a problem for integrity if the funder wanted something different than they got […] Is there something in my subconscious telling me not to criticize the ministry's strategies into ruins, to put it simply? Is there something there that has implications for integrity?*
>
> *Norwegian mid-level researcher*

Furthermore, even where researchers do produce valid, good quality research for funders and present this accurately to funders, their subsequent interpretation and presentation of findings can be inaccurate. This issue was exemplified by a Norwegian senior researcher who had experience of this problem:

> *We did a pretty thorough and systematic job and sent it to [the governmental agency], and by coincidence we got news that [the governmental agency] had forwarded it to the ministry […] with an attachment which was a kind of summary of our report. I do not know how common this is, but I got hold of the summary through a journalist who had received it, and it included a presentation of our report that did not correspond with what was in the actual report, so the people in the ministry got a completely different impression of our research than we had presented in our own summary. It is clearly a problem for research integrity that our research is presented as something completely different than it is for the political leadership in this country*
>
> *Norwegian senior researcher*

A few other problems were also identified regarding conflicts of interests between funders and researchers. First, in Norwegian and Italian focus groups it was highlighted that the topic selection of funders can be problematic. A Norwegian senior researcher described how funders can choose to fund topics that researchers do not think require further investigation or frame research questions in a manner that researchers do not agree with:

> *A part of the problems with commissioned research is also that what we are researching is often decided by the one's commissioning the research, and it can happen that we think that the topic has already been thoroughly explored or that the research question should be framed in a completely different way, in order to maintain research integrity*
>
> *Norwegian senior researcher*

Moreover, an Italian research manager thought that research orientated to funder interests "*creates a somewhat artificial academic debate on some themes".*

Second, in terms of good methods, an Italian mid-level researcher highlighted that in collaborations with big companies, researchers "*manage to get really interesting results, but they are not reproducible… [therefore] the research is less honest than that I could do if data were public".* It was reported that the participant thought that the reason for this is that companies do not allow permit access to data, making it very difficult for other researchers to validate the findings of the research.

Third, the UK research governance advisors were able to provide some interesting insights to how academic-industrial research collaborations can be challenging in terms of negotiating research ethics. Here a participant identified that third party organisations do not necessarily understand academic standards of research ethics and can be driven by different research values, with interesting in commercial gains or Intellectual Property (IP):

> *I think sometimes private companies or third party organisations not understanding the research process, perhaps not where it has to go through an ethical review and they don't understand those- just because you can't do something doesn't mean you should and they're like well private companies can often be- we can mine all this data, well ok, you can do that, doesn't mean you should and a lot of researchers saying no we have to go through an ethics committee and then ethics committees start asking those questions about the processes and what they propose to do and then they see it as a blocking rather than helping research. I find we do get those loggerheads with different cultures I guess between a research culture and a private company which is going to be driven by different aspects, whether it's monetary or IP*
>
> *UK research governance advisor*

From the UK perspective, the research governance advisor group described how part of their role is to advise and support researchers to help them deal with negotiating situations that pose potential conflicts of interests:

> *In that situation [a conflict of interests], yeah we do often get researchers will come to us because they just don't know how they're going to manage the process and they'll rely on us to help work through that process and lean on perhaps what we call faculty research ethics so each faculty has someone who is in charge of research ethics and integrity within the faculty and we'll often rely on their expertise to help them navigate these processes and then of course (inaudible) I guess we often might be helping people with contracts, research contracts, we're often very useful in terms of navigating those different processes and where there's conflicting interests certainly if they're working with external org- third party organisations who say they want ownership of the data, they're not saying its university's data and having to navigate those processes. We do get approached quite commonly.*
>
> *UK research governance advisor*

Other issues of conflicts of interests that were identified were first, In the Italian senior researcher focus group, one participant whose field is biomedical research said that he has to negotiate *"schizophrenia"* in his research because there is a conflict between doing small research just to learn and larger research that is useful to society:

> *[You want to] add a small piece to knowledge; do research just to do research and learn, [but also you need to do research that is useful to society]. This can be perceived as a positive aspect [doing research that is useful], in the sense that the invested money goes back to society to cure something; but it also negative because it puts the researchers under high pressure. The pressure is not only the pressure to publish in order to make a career, but also the pressure to be able to "sell" what you do in order to get funded.*
>
> *Italian senior researcher*

Second, in the Italian mid-level researcher group, there was discussion about conflicts of interest when conducting ethnographic field-work or dealing with research participants. It was reported that one individual pondered how researchers should deal with situations if they for example, view criminal behaviour whilst conducting fieldwork and where the boundaries should lie in terms of intervening or reporting this to the authorities. This led this researcher to question if researchers should have more formal guidance on these issues:

> *Should we have a code of conduct? Should there be something that defines the researcher job and that traces the contours and boundaries of acceptable practices?*
>
> *Italian mid-level researcher*

Third the role of researchers as experts in political discussions was discussed by Estonian senior researchers, who questioned whether researchers should get involved:

> *one thing I want to say from my experience, in environmental studies where I work, there is a specific problem, probably social scientists have the same. Namely you are partially in public relations also in politics and you are constantly asked for opinions. And now there are two possibilities, either you say you do not comment on it, it is not your area, I do not think it is right, taken your specialty who else should know these things, if you do not. But the things that you speak and where you speak, is potentially a very dangerous spot… You can say that the scientists should stick to his last and talk only of what he knows, but from society's logic many other things have to be done. To know best evaluations, prognoses, such type of things. And I see a danger here, where ethics can become… one has to have a very strong ethical basis to survive in the system. In the worst case other people will come out who say they know things they do not really know.*
>
> *Estonian senior researcher*

5.5 Accessibility and translation of policies

Accessibility and translation of policies were barriers to research integrity that were discussed by UK research governance advisors, who had a unique perspective due to their advisory roles. Regarding accessibility, two challenges were identified. First, there were concerns that older researchers may struggle to keep up-to-date with developments in research policies, compared to younger researchers who are used to current levels of research bureaucracy. Thus, posing a challenge for research governance advisors to support and advice older researchers to ensure that they are doing research appropriately:

> *I suppose with sort of the older researchers as well, the processes have changed so much over the years, for them it will have got more and more bureaucratic and more and more things they'll have to do in order to do the research but with younger researchers it's this is the process and they'll go ok, right, I'll get all the bits so I think sometimes it can be more challenging with the more experienced researchers (laughs), the ones who know what they're doing and they know the ins and outs because they're having to do that little bit extra to get there now so I think they can sometimes be the most, yeah, challenging to sort of get them on board and get them doing what they need to do*
>
> *UK research administrator*

Another challenge regarding accessibility identified was the problem of researchers facing information overload because of the wealth of policies they encounter in their everyday work. It was suggested that Information is not just hard to find, but also there is so much it makes it difficult for researchers to read and comprehend all the relevant information available:

> *I think someone touched upon it earlier about researchers not being able to find information and I think that's also a barrier, but also a barrier is there's a lot of information and I think a lot of researchers come to an institution [and] they see twenty policies that they might have to look at, then they get funding and they've got terms and conditions there, then they want to publish in a journal and they've got terms and conditions there, so I think another problem's just the vast amount of information. I think some researchers just drown in it a little bit…*
>
> *UK research administrator*

Finally, there was a link to accessibility of policies in a discussion between Norwegian junior researchers, where some participants questioned whether the ideals of research integrity were too abstract or grand, rendering them unworkable in practice, perhaps inaccessible:

> *There is something about the whole… I do not know, maybe we have too lofty ideals? Can I say that? It does not sound good*
>
> *Norwegian junior researcher*

In terms of translation of policies, several problems were identified. As stated above, it was highlighted that in the UK there are lots of policies relating to research integrity, however, the

research governance advisors noted that these do not always necessarily fit well with research projects. Thus, there is an onus on researchers to ensure that policies are interpreted in relation to their research, to ensure that their research is conducted appropriately:

> *Then they've [researchers] got the responsibility of interpreting them for their own work, which that's as much as anyone can do really because you can't have one model fits all, so it's in the nature of lots of different activities*
>
> *UK research administrator*

Another issue of translation is raised by training in research integrity. It was suggested that this can be challenging because faculties and disciplines have different research cultures, where research integrity can have different connotations. Furthermore, different disciplines will use different technical language. This can make the work of research governance advisors more challenging and also corresponds with talk regarding research cultures where participants describe challenges in conducting collaborative research across disciplines:

> *one other thing just to add to that is when you work across the university, across faculties, the culture of research integrity means something different, completely different to the archaeologist and anthropologist in Arts and Humanities to an experimental psychologist in Science for example, trying to again- message management, trying to speak in each faculty's own language that they understand can be quite tricky and you're having to tailor your message and when you do training and workshops and having to really get specific- faculty specific examples, you know, to try and get them to engage can be quite tricky at times.*
>
> *UK research governance advisor*

Moreover, it was explained that cultural differences between different countries can also be challenging when translating research integrity policies, even within Europe, as the following exchange between UK research governance advisors exemplifies:

> *-I suppose it can be how the different country approaches it depends how you approach it which what do you follow, how do you bring all that together to make sure everyone is doing research how it should be done and its, you know, within their own institutions and I think that must bring in quite a big barrier and I think especially with international collaborations as well, must be, you know, how do you bring it all together, how do you make sure everyone is doing the research right.*
>
> *-Very much so… just even within a European context…*
>
> *UK research governance advisors*

5.6 Main risks faced at your institution

This issue was only reported in the UK focus group with research governance advice staff, so the findings here only provide a UK view of what risks to research integrity were deemed most important. Three main issues were raised: first, there were concerns about lack of resources in terms

of institutional funding for research governance in a climate of increasing student numbers, thus, having enough staff to train, support and provide oversight of research. But also, these staff had concerns regarding the workloads of researchers, with the perspective that workloads are increasing, notably due to demands of government evaluation of research and teaching (REF and TEF), to allocate public money to UK universities. Second, individuals voiced concerns about inconsistencies in the ethical review of research, due to varying focus on different policies, but also lack of awareness amongst some researchers about policies. Finally, there was concern about collaborations with industry, where it was thought that there could be risk of conflict of interests between academic institutions and industrial partners who have more commercial interests in research.

5.6.1 Lack of resources

Lack of resources was identified as a risk. It was thought that factors such as greater numbers of students are increasingly putting a strain on research governance work. One participant thought that this increased the probability that problems may not be identified research governance reviews:

> *I think logistically (inaudible) resource just with the continuous increase in numbers and put strains on the research ethics committees, they're having to review more in less time and there's more chance of things getting missed and- I that's a risk.*
>
> *UK research governance advisor*

Moreover, it was feared that management may not realise the lack of resources or appreciate the risks that this could pose to maintain research integrity and ethical research. It was highlighted that the oversight of research can be reactive, only dealing with an issue once something has gone wrong:

> *I think as well sort of the top management as well not really sort of losing touch with what goes on research integrity wise, you know, the day to day business and then not sort of understanding the resources that are required which then have that same effect really, they say oh that's fine, that's ok as it is without really sort of getting to grips with, as [other participant] said, the university's growing, we more need resources but they just kind of seem to lose touch with that and its just- you're trying to carry on with what you've got but the work's ever expanding and it stretches everyone to full capacity and I think that's where things can go wrong, that's where things are missed and that's where, you know, whether its int- unintentional misconduct can happen because you've not got someone there on the ball all the time because they just can't- they haven't got the capacity to do it so things do get missed and I think that is a real big risk. It's completely unintentional but I think it's a big risk and it's one of those things that we've touched on before that things- something will only happen when something has gone wrong and I don't think that's a really good position to be in at all because its- you're firefighting aren't you rather than having things in place and having the resources there to minimise the risk. Its pushing it too much sometimes I feel.*
>
> *UK research governance advisor*

Not increasing the resources as demand grows means that staff advising researchers and monitoring research are spread more thinly and it was suggested that institutions should invest more money into providing staff to support researchers on research integrity issues as a solution:

> *And staff numbers grow the resources don't seem to grow (laughs) to match it and I suppose, you know, the university, getting as many as students in as they can is their number one priority but without them, you know, investing in the resources to support those future researchers, the current researchers and I do worry that it is going to take something to go wrong in order to be ok, we need to reassess this, maybe we do need to put more money into x, y and z so like you said sometimes it is very much a lip service, yeah we've got all these things but who's actually monitoring it, who's making sure that people are doing what they should be. If it's one member of staff covering one department can't do all that, you know…*
>
> *UK research governance advisor*

There were also some interesting discussions about the issue of resources in terms of researchers themselves that were raised later in the session. Here, participants thought that researchers faced increasingly high workload burdens which could negatively impact upon research integrity:

> *I think their [researchers] workload gets more and more- Seems get more and more each year. Like you were saying before, they have several different roles and they're trying to juggle it all and especially when they're doing reviews, you know, they've got- they might have a huge document to review which has got to be done for next week, we've got to do this, we've got to do this, and again that's where things may get missed and if people are being stretched at full capacity but still being expected to produce the same amount of work and more work but to the same level and it's a real struggle for researchers I think.*
>
> *UK research governance advisor*

Pressures for researchers included were the Research Excellence Framework (REF) and teaching responsibilities:

> *…you've got the pressures of REF coming up again or they've got to have x amount of research income, they've got to be applying for x amount of, you know, different calls. They've also got to do the teaching, they've got to get this marking done, they've got to- you know, to be flitting from one thing to another like that, to have all those pressures, I don't know it must, yeah, I can't see- it's not going to have a positive effect on their- how they approach research integrity.*
>
> *UK research governance advisor*

Furthermore, it was thought that increasing competition in the higher education sector also imposed pressures on researchers and university staff as a whole:

> *I'm not saying it's just recent, I think it's definitely that's grown and grown and grown, the competitiveness now of an institution as a whole and then departments and faculties within that and how they compete with one another, how they compete with other organisations, how they compete with somewhere halfway across the world, I think that's an ever-growing pressure and I think that has sort of built up over the last few years.*
>
> *UK research governance advisor*

Academic staff were acknowledged as an important part of research governance review processes, which added considerably to their workload. However, one participant thought that recognition or reward from the university for these staff was inconsistent and sometimes lacking:

> *I also have a lot of sympathy for the people who engage or your research ethics committee members, your chairs, who are doing this on top of their academic role, it's a huge workload and the disparity across even in my own institution in the faculties that it's what they are rewarded for- some get citizenship points which helps them with promotion, some get a workload amount, some get nothing at all and it's amazing and you just look at the workload, and there's times where I'm sending stuff and I feel- I'm so sorry… but this needs actioning. I don't think they get enough recognition as well and I think that's something that should be rectified.*
>
> *UK research governance advisor*

5.6.2 Inconsistencies in ethical review

Another risk identified by participants was that there can be inconsistencies in ethical review, so that depending on the 'flavour of the month' some issues may receive more attention to the detriment of others. This can lead to inconsistencies and things being missed:

> *I think another risk is that every so often then a new policy is introduced and as I say is flavour of the month, but the other areas of integrity are sort of left to the wayside and so there's a lot of focus on one thing at a time. You see that in committee meetings where in waves a particular area is focussed on and then you look back and you say they used to pick up this sort of thing all the time and they're not doing that anymore because something else has happened and they're really hot on that so there's consistency elements because of new policies coming in…*
>
> *UK research governance advisor*

Moreover, it was highlighted that there are different levels of awareness regarding policies in institutions, with some people being hard to reach and therefore, not knowing what they need to know. Senior academics were specifically identified as an example because they have busy workloads:

> *…so, I don't know if it's the same at every institution but getting the message across to everyone you need to in the institution I'm in is an absolute nightmare and there's just some people you just never really- you try every possible route to say we've got this new policy, follow it and a year down the line somebody comes to you, never knew about the policy so… I've had so many situations where I've emailed senior academics and then they don't respond, I've emailed again. As soon as you pick up the phone I get them and I speak to them and I get five minutes of their time but they're so busy, they've got so many other things, they've forgotten I've even spoken to them and a month later I'm having the same conversation (laughs) that I had a month ago so it's very difficult and challenging at times but, yeah, so one risk is just people not knowing what they need to know unfortunately.*

UK research governance advisor

5.6.3 Collaborations between academia and industry

In a discussion about research collaborations with industry, there was some concern that negotiations and compromises that may be required for academics and private sector researchers to work together have the potential to impact upon research integrity. It was thought that industry has a different agenda to academic research, with more commercial interests:

> *I think sometimes the drive and the incentive to, for research income can actually have a huge influence on decisions and how things are swayed at the end of those processes when you're negotiating something which is a horrible thing to say. Obviously integrity would still be maintained but it depends on how far (inaudible) have to go- As research funding is squeezed in all directions, more and more are going- people are going to industry because they do have funding but that comes at a price in terms of the industry party would drive the research question a lot more potentially because they need something out of it as well, it's not for the benefit of academia and research. It will be to improve their products and improve their sales and whatever…*

UK research governance advisor

Summary:

The focus groups have revealed a variety of challenges to research integrity. Many of the barriers to research integrity are systematic. Participants cited many pressures in everyday research work, seen to stem from systemic issues. Competition, and the pressure to publish or perish pose barriers to researchers conducting work with integrity. Funding restrictions and research output evaluation can be very influential on everyday research practices, even incentivising research misconduct or QRPs, thought to diminish research quality.

Research cultures can have a positive or negative impact on research integrity. Factors that can create barriers include: leadership, workload, power structures, and support of researchers and students.

Conflicts of interest can be a challenge. Participants focussed mainly on conflicts between funders and researcher interests. UK research governance advisors identified accessibility and translation of research integrity policies as a barrier to research integrity. In terms of accessibility, it was thought that older researchers may not be up-to-date with developments, information can be difficult to locate and there is lot of it. Translation of policies into action was regarded as a barrier to research integrity because there are no one-size-fits-all policies; researchers need to be responsible for translating policies to their own research requirements. In training, or when working collaboratively across disciplines or cultures, different technical language and understandings regarding research integrity can be challenging to negotiate.

The main risks outlined by research governance advice staff largely echo answers to the wider question about barriers and challenges to research integrity posed to individuals across all the participant groups. However, what this adds is that UK research governance advice staff also feel that institutional resources for their work is limited when they also face increasing workloads and challenges to meet the demands of their work. Furthermore, it is interesting that they perceive that

this current state-of-affairs means that dealing with research governance issues is reactive rather than preventative.

6. Knowledge and impact of research integrity policies

Overview

Individuals in the researcher participant groups were asked about their knowledge and awareness of research integrity policies. Five themes were identified: general levels of awareness, knowledge on a need-to-know basis, confidence that policies exist, experiential awareness about research integrity rules and responsibility.

6.1 General levels of awareness

Participants from across all countries had varied levels of awareness regarding institutional and national policies relating to research integrity. Some participants reported an awareness of journal policies, national and international policies such as Committee On Publication Ethics (COPE) policy, the Vancouver protocol on co-authorship and data protection policies. In Estonia mid-level researchers demonstrated awareness of (what was at the time of interview) a planned national code of conduct on research integrity:

> *- COPE is the first that comes to mind, the one probably most widely used in the U.S.*
>
> *- We have the Code of Ethics of Estonian Scientists.*
>
> *- In this regard, I have not yet managed to get acquainted with it yet, but a couple of weeks ago, the new Code of Conduct for Research Integrity… or something like that was circulated, well, such a document has now been completed and is waiting for approval… but without reading it I think that it doesn't include anything cardinally new.*
>
> *Estonian mid-level researchers*

However, overall, there tended to be a general lack of awareness of policies reported by researchers:

> *- Do you think people are aware of the policies widely at all, like colleagues and- (interviewer)*
>
> *- As a PhD student, all the PhD students in my office, no- I don't really understand what we're talking about right now so I'm going to say no from me. (laughs) Like don't cheat, that's what you're told. Run your thing through Turnitin [plagiarism software] to make sure you haven't plagiarised and always do the best you can, that's as far as I knew-*
>
> *UK junior researcher*

Interestingly, in the UK there seemed to be a theme of information overload, due to large numbers of policies, making it hard for researchers to read them all and keep up-to-date with any changes.

This was also identified by the UK research governance advisors as a barrier to research integrity (see accessibility and translation of policies). An example of the challenges of dealing with lots of policies can be seen in the quote of the UK mid-level researcher below, who stated that they knew that policies existed and where to find them, but did not really know the content because there are so many, and they have not the time to read them all:

> *The thing I would say is I am aware they exist, I know where I can find them, whether I go to them, and I have the time to go through of all them, 'cos there's a huge amount of them, as far as I remember, a huge amount of data to read and bits and pieces so I'm aware of it but I don't remember what's the definition of research integrity for example. I hold my hand up. (Laughs)*
>
> *UK mid-level researcher*

6.2 Knowledge on a need to know basis

There was some indication in focus group discussions that some participants tend to gain awareness of research integrity policies only when they encounter situations that require them to refer to guidelines. It was reported that Italian (junior and mid-level) researchers had gained awareness of policies regarding journals and publications and conference submissions encountered though their work when they have needed to disseminate their work. In the Norwegian mid-level and UK mid-level and senior researcher focus groups, some participants specifically reported interacting with policies on a need-to-know basis, when they felt that they needed advice on how to deal with a situation:

> *For me I think it would be something about consult, if I end up in a sticky situation or something- Yeah, it's not something that currently informs my conduct or my behaviour…*
>
> *UK senior researcher*

6.3 Confidence that policies exist

Participants from the Estonian junior researcher and UK mid-level researcher groups mentioned they felt confident that institutional or national policies exist regarding research integrity issues despite having limited awareness of institutional policies:

> *I believe that definitely something there is something a bit in some form in Estonia or at the university or at the institutes there is something written down that regulates.*
>
> *Estonian junior researcher*

> *I live in constant trust that the university has a policy for absolutely everything, well I haven't found a counter example yet. I guess I haven't gotten to a point where I felt I needed some institutional definition so- as I say I live in confidence that we have policies for absolutely everything, but I have never felt so compromised that I wanted to reassure myself of any institutional polices.*
>
> *UK mid-level researcher*

6.4 Experiential awareness about research integrity rules

Some participants in the Italian mid-level and Norwegian and UK senior researcher focus groups reported that they learnt about research integrity rules through the process of doing research. In the Italian focus group, a participant highlighted that in his field, there are many *"unspoken rules"* and others are *"formalised"*. Indeed, a UK senior researcher described how academics learn things through doing work:

> *you know, being an academic… so it's the extreme apprentice kind of thing, so you do a PhD and you do a post-doc and sort of you learn how to do it, you pick up things along the way…*
>
> *UK senior researcher*

One of the Norwegian senior researchers described how they thought they had an idea what would be in institutional research integrity policy documents but had not bothered to check them out. This corresponds with concerns raised by the UK research governance advisors relating to accessibility of policies, where it was feared that older researchers may feel confident that they know what they are doing and are therefore, vulnerable to lacking awareness of policy changes (see section 5):

> *I never bothered to check it out. I like to imagine that I know what they say, but I really do not know*
>
> *Norwegian senior researcher*

6.5 Responsibility

Responsibility for the development and implementation of policies was an issue raised in Italian junior and senior researcher focus groups. Participants questioned who took responsibility for research integrity:

> *[Who is in charge] of controlling students? [And] who should defend the integrity of research?*
>
> *Italian junior researcher*

A concern raised by an Italian senior researcher was that funders have policies regarding research integrity. However, it was not clear who was responsible at the institution for ensuring these rules are followed by researchers. Thus, he stated that he was unsure if researchers know what these rules implied for their research:

> *I do not know how many of them [researchers] are actually aware of what reliability, honesty, respect and accountability are.*
>
> *Italian senior researcher*

6.6 Policies in existence at institutions:

Members of the research administrator/managers/governance advisor focus groups were asked about the existence of institutional policies but is only reported specifically by Italy and the UK. In the

Estonian report, although there was discussion about research integrity policies, specific institutional policies were not specified, however, there was reference to the new Estonian Code of Conduct for Research Integrity that, at the time of interview, was due to be signed by most of the research institutions in Estonia.

6.6.1 Italy

All four Italian focus groups revealed an apparent lack of policies specific to research integrity in Italian institutions that they have experience of (see above). When the research managers were asked about specific institutional policies one respondent is reported to that the institution has an Ethics Committee for Human Research that oversees projects to ensure that they meet national and international ethics requirements. However, it was also highlighted that this committee is not mandatory. Other participants are reported to have had some reservations about this committee because the process of review can be time consuming, bureaucratic and potentially limit the freedom of researchers.

Another committee identified was the Ethics Commission, which is who specifically deals with issues of misconduct. It was stated that there are no specific guidelines on research integrity at the institution, and instead the committee works from the Ethics Code, a document that outlines professionalism, only partly dealing with research misconduct. The participant clarified that there are no registers kept of misconducts and although the Ethics Committee is supposed to be independent, they thought it was a mechanism of the Senate:

> *The Ethics Commission was thought as an independent body that received the reports and possibly intervened; now I think it works as an instrument of the Senate: that is to say it is the Senate that receives the reports and the Senate or the Rector hand them to the Commission, or the senate asks the Ethics Commission for opinions*
>
> *Italian research manager*

6.6.2 UK

In the UK the research governance advisors highlighted that there are an array of different policies covering different aspects of research integrity at their institutions. One individuals stated that as well as these, their institution had one core document that effectively lists and signposts to these policies:

> *…[we have a] core document for researchers which goes through the kind of hot topics and research integrity so things such as ethical approval, data protection, conflicts of interest, intellectual property, authorship and publications, so there's a whole list of topics but pretty much all of those, or most of them, have a separate university policy on them so our full document is almost just a signposting document almost saying if you've got a conflict of interest go to the declaration of conflict of interest policy or go to our data protection policy or go to our records retention schedule so it's absolutely huge so, yeah, I mean data protection, bribery and anti-corruption, equality, intellectual property, conflicts of interest, yeah I can probably name about twenty if I'm honest which is kind of the issue with research integrity I think, it's kind of an umbrella term and you can fit most things under it I think, in some way or other.*
>
> *UK research administrator*

It was highlighted that the institutional policies are influenced by the UK Concordat to Support Research Integrity which sets out key commitments for universities:

> *I think they all are actually things that are in the concordat that they've made sure that everything is covered, they've ticked every box. But they're just essential resource that people are guided to go and see.*
>
> *UK research administrator*

Moreover, legislation and regulations also guide institutional policies, for example data protection was identified as a key policy. It was thought that this is because it is part of UK legislation and that Universities can face high penalties if data protection rules are breached:

> *They all interlink, don't they? There's the open access agenda, open data agenda, at the same time we've got a new data protection regulation coming in so I think pull all those together and it's clear that data's just a hot topic but if I was going to be very sceptical, which some days I am, I would say it's partly because it's one of the most legally regulated areas as well and universities can be fined and be penalised as with individuals so those being sceptical I'd say there's a little bit of risk management on the part of institutions as well there (laughs), not wanting to get a fine from the Information Commission's office but that's just being sceptical.*
>
> *UK research administrator*

6.7 Effectiveness of policies

All participants were asked about their perceptions regarding the effectiveness of policies. Most reports included information about this question. However, there was nothing reported for this in the Norwegian junior researcher and research administrator focus groups. Four themes were identified: lacking policy and procedures, challenges to effective policy implementation, helpful policies and fears of overregulation.

6.7.1 Lacking policy and procedures

This issue was discussed in most in Italian focus groups where it was reported that there was a lack of institutional policies specifically relating to research integrity at most Italian universities. Although it was identified that there are codes of ethics at institutions, these codes have few articles relating to research integrity issues and these were neither effective nor operative and rules are not explained to students or early researchers. It was reported that the participants felt that there are many problems that stem from this lack of regulation, for example:

> *[Masters students] do not know what plagiarism is.*
>
> *Italian junior researcher*

There was also a lack of clarity regarding action on policy in terms of disciplinary procedures expressed in other UK and Estonian junior researcher focus groups. Participants were unsure of consequences and who is the responsible person at their institution to report issues to:

> *- But if such a situation [of a malpractice related to bad treatment of people] arises, do you have anyone to go to, or you know where to go to on the level of university to disclose such things? (interviewer)*

- Wait, is it supposed that I want to tell on my colleague because I think he is doing something he should not?

- Yes, but I do not know that at the university we would have a concrete instance which deals with such things.

Estonian junior researchers

6.7.2 Challenges to effective policy implementation

There were several challenges raised regarding the effective implementation of research integrity policies, these focussed around the limitations of policies: focussing on content; implementation issues such as enforcement and burdens on researchers; and finally, issues relating to policy implementation and research culture.

Limitations of policies

A range of limitations of policies were identified by participants. An Estonian mid-level researcher thought that policies or codes without legislative underpinnings does not have real power and subsequently, will not result in behavioural change:

But, if there is a code that does not have the power of the law, then everyone circumvents this code, that it has to be a very strict law that would make people behave differently. I feel that the code of ethics does not change anything in that respect, that the scientist is smart to evade all these points if he wants.

Estonian mid-level researcher

An issue that was discussed in several focus groups was the importance that policies are fit-for-purpose, whereby poorly constructed policies were viewed as unhelpful:

…a lot of these policies are people putting out stuff there that is clearly not very helpful or not very well thought through and those kinds of policies are not helpful

UK senior researcher

A key concern was that the content of policies can lead to them having limitations. Some participants in the UK mid-level and senior researcher focus groups thought that some policies (e.g. journal policies) risk being merely 'for show' and are essentially superficial, tick-box exercises:

So, journal policies are- A lot of it is with window dressing, let's be absolutely honest. I mean they're required to tick a box saying that there is no- that you satisfy the ethical conditions, they require you to tick another box saying there's no conflict of interest. They give vague descriptions about what these mean… really you don't really know what they want, and you presume that you're a good person, so you can tick the boxes and move on…

UK senior researcher

Participants across several focus groups discussed factors regarding making policies fit-for-purpose. An important limitation relating to this was that different disciplines will have different requirements regarding research integrity, so that attempting to construct overarching rules for all is inevitably imperfect:

> *I always question who wrote them. Were they scientists? or people who went to? because the fact that there is one policy suggests that they're not because there can't be one policy for- different fields have different definitions don't they, so it has to be specific to fields, that's- I have an issue with that by the way, I think it was written to in a sense for us to- I see it as a guideline but it's not a perfect guideline…*
>
> *UK mid-level researcher*

Indeed, in discussing policies, an Estonian junior researcher proposed that different disciplines should define their own notions of 'good science', from which policies can then be derived. Rather than depending upon institutions or national level guidance:

> *I think that science as such is not different in different nations, universities, geographical regions, human groups. What I wanted to say is that what is good science is defined among the top scientists of the corresponding science themselves. Perhaps, in a word, what is good oceanography, should be agreed by the oceanographers across the globe. Oceanography is something that does not depend on the university, the nationality, in a word, they themselves agree within each scientific field…*
>
> *Estonian Junior researcher*

Another issue discussed in the UK mid-level researcher group was that policies have limitations because they cannot advise on 'subtle' contextualised aspects of research integrity dilemmas that researchers face in their everyday work:

> *I can imagine what there is about scientific misconduct, they are probably, well definitions or- I don't think they talk about the more subtler aspect that we're discussing about research integrity, so I mean I would be doubtful that there is something about that, so therefore you rely on you going after the scientist and as we said before whether your values in life so they're very much related to that so it's like personal choice that you make and you try to… I don't think the university will help me…*
>
> *UK mid-level researcher*

Indeed, it was also highlighted by a Norwegian mid-level researcher that some questions of research integrity have no guidance in the form of codes of conduct, and have no right answers, therefore requiring researchers to discuss issues with others and reach their own conclusions regarding how to proceed:

> *One always get to questions which there are no right answers to, or codes of conduct for I believe. That one needs to discuss. I guess that is the right way, that researches discuss it. Researchers who have similar experiences, so that one seeks each other's council and do not make a private decision*
>
> *Norwegian mid-level researcher*

A further limitation regarding the content of policies raised by Estonian research administrators was that policies can quickly become outdated:

-We put the good practice down, but let's say real life changes, I fear the most that things that are written down will age quicker than we would want.

-They will be old as soon as we get to the agreement.

-This is the worst… it will be a historical document at the moment it is signed.

Estonian research administrators

Indeed, UK research governance advisors recognised that policies often need refinement as issues (such as research needs and changes in legislation) arise to ensure that they remain functional, implying that policies that are regularly reviewed and adjusted where necessary, may be more likely to be successful:

Where I think researchers struggle in my institution, and what we get a lot of queries about, is there's some policies that are absolutely fit for purpose, in that they've been developed for a university wide purpose… I think applicability to a specific case example is where they're not always helpful but I'm not sure institutions can combat that other than having professional services staff like us… we've seen that happen where something gets published perhaps around safeguarding and nobody's asked about research projects and suddenly someone comes to us and says well I'm dealing with a research project with vulnerable children, says nothing in this policy about research, do I have to go through additional hoops or not and it starts a whole project off to kind of make it a bit more fit for purpose for researchers.

UK research governance advisor

Policy implementation

Participants also discussed the challenges of policy implementation. The need for structures to implement policies so that they are effective, was identified in Italian focus groups where participants reported a lack of policies, but also a lack of clarity regarding oversight and implementation of the policies that were in place. The issue of oversight was also raised by UK research governance advisors who highlighted that there were not enough resources to follow-up and monitor policies, therefore making it difficult to ascertain how effective they are:

It's hard to monitor because we're not going to be involved in an individual project to see how things are going day to day and whether they are indeed being implemented as they said they would be at the outset, so I think that's the biggest problem to answering that question is that no-one can actually monitor projects at that level or research at that level to know how well that policy's been implemented.

UK research governance advisor

Another barrier to implementation of policies highlighted by some participants in the UK was that policies can be burdensome for researchers, who can feel overloaded with information and do not have the time to dedicate to reading through policies:

> *It's very difficult to know how to communicate it so that its useful- contains useful information and that people will pay attention 'cos like the policy documents I have opened probably at some point, saw how long it was and closed them and the proper thorough we've gone through this and this explains everything but don't care. It's difficult to know how to get across what you need to know in as short a form as possible, so you can actually take it in.*
>
> *UK junior researcher*

Indeed, one UK senior researcher described how the sheer volume of policies and their updates communicated to researchers, can make it difficult for individuals to discern which things are most important:

> *…its sometimes very hard to distinguish the signal from the noise, you know, yet I get yet another email, click on this link for a very important update to policy x, y, z. Should time be spent two hours reading this? I don't know, probably, maybe, I don't know. (laughs) So it's very hard because everything is channelled to you in the same way so it's very hard to see what matters and what doesn't matter…*
>
> *UK senior researcher*

Furthermore, an Estonian senior researcher highlighted that even if once familiar with policies, over time, researchers can forget what is written. Therefore, they thought that periodically reminding researchers about policies might help:

> *Maybe if you sign it once you go through the material and think about it, maybe three months, perhaps a year, and then it slowly slips your mind, like any information. If it was somehow repetitive mechanism, that was reminded from time to time…*
>
> *Estonian research administrator*

Research culture

Several participants thought that research culture was more important than policies in dealing with research integrity issues. One Estonian mid-level researcher was very sceptical about the imposition of policies from the top-down (they never get read) and thought that rules developed from the bottom- up were far more influential to guiding behaviours:

> *What I want to say, is that I think that the research community works better than the statutes and documents. The statutes and documents, what is their role or function, why they are adopted? They are adopted because the European Science Foundation has a similar one and we also need it then they will not work. Or it is something that, in a word, has been imposed by the Ministry of Education and Research and Estonian Research Council, that at some point we are creating this document, and now all scientists have to follow it, it will not work because nobody will bother to read it. If it is an agreement between the scientific community that we come together and introduce such rules of the game or formulate those rules that we already know that exist already somewhere, then it might work. But in that sense, as far as the written rules of behaviour go, I am rather sceptical.*

Estonian mid-level researcher

Similarly, a UK mid-level researcher thought that without a good culture supporting the implementation of guidelines or regulations, policies can remain superficial and not be effective:

> *…but what's much, much more important is to create the appropriate culture and we have this in chemistry with safety for example and what we've found is that if the culture isn't right then all of the health and safety requirements become a box ticking exercise but they're not internalised by people whereas if you build an overwhelming culture of people showing what the right behaviour is and supporting the right behaviour and of correcting it when things go wrong then you get a much, much bigger- a much better result…*

UK mid-level researcher

However, the research culture was also identified as a boundary to the implementation of rules. Several participants raised the issue of power imbalances in the workplace, and an Estonian mid-level researcher highlighted that more senior people can make it difficult for subordinate researchers to report incidents, despite institutional policies:

> *Do you feel that you can turn to the head of institute or somebody [for help]? (interviewer)*
>
> *2.1: Depends on against who you are going. If the person has too high scientific credentials or those of the academic system, then it's like the old saying, "Don't spit towards the wind!"*

Estonian mid-level researcher

However, this view was not shared by all in this focus group. Another participant thought that because Estonia is a small country, people in power are less able to get away with or benefit from abusing their position:

> *In the case of Estonia, I have noticed that these types with high credentials, they are more likely to be afraid. If there is still a person who has experience in writing in the newspapers, they will not dare to do anything. In my opinion, such fear of power is completely unjustified in Estonia. I'm sorry for thinking that way but in my opinion, it is overstated, no-one, no matter how high bureaucrat, I can find out when he's trying to hustle somewhere. Estonia is too small for this. I do not believe in this power by [people] in] higher position to put you down. This can happen, but I'm afraid it will get back to him in few years, it is not that simple.*

Estonian mid-level researcher

But interestingly, an Estonian junior researcher reported awareness of cases where universities use their power to act to protect themselves as an institution, rather than employees, making it difficult for researchers to get help regarding incidents of alleged misconduct and potentially stigmatising researchers who try to whistle blow:

> *I have heard also of the cases where people have felt that the human resources department does not protect them as workers but protects the university as the institution. So then, when such stories spread around the university, then you have increasingly the feeling that it makes no sense to go anywhere, whom am I going to tell, I might not be able to find work anywhere anymore.*
>
> *Estonian junior researcher*

6.7.3 Helpful policies

As well as criticisms about policies there were some reflection on how policies can be helpful for researchers and what should be included in policies to make them helpful for researchers.

There was some discussion regarding specific policies that were identified as being helpful. In Italian focus groups, some individuals reported that journal and conference policies had provided useful guidance. Moreover, the Norwegian senior researchers' discussion about policy centred around the Vancouver Protocol on co-authorship and they described how this had been very helpful in their work:

> *So, for me it [the Vancouver protocol] has been very helpful through many years in the field of social science, so I do not see that… I see that it is good to have. It is well established, and has been around for a long time*
>
> *Norwegian senior researcher*

Policies were thought to be beneficial for a number of reasons. It was thought that they can be helpful for raising awareness about research integrity and putting the topic on the agenda in the scientific community:

> *But, definitely, also these documents and papers have some kind of place or role in this topic, in my opinion, may not even be in the sense that what is spelled out there, which points, but perhaps the ethics codes or the code of conduct of research integrity have a more important role in raising this issue to the agenda, to keep it in focus, that it an important thing to think about, that is important in the scientific community, that it is on the table, and is a kind of reminder…*
>
> *Estonian mid-level researcher*

Indeed, it was realised that policies can help promote discussion amongst researchers, particularly in relation to 'grey areas' or where content is open to interpretation. These discussions were viewed as positive to developing thinking about research integrity:

> *Its [Estonian Code of Research Integrity] positive side is that it lays down some statements in regards to the grey area, or it can be interpreted in different ways, and it will start a discussion where people will start to think about it, and this is what we want.*

Estonian research administrators

The Estonian research administrators also discussed how policies, through writing things down, can be important to reinforcing a culture of research integrity:

> *- But [integrity documents] is creating culture.*
>
> *-And good practice is writing this culture down.*

Estonian research administrators

Indeed, one Estonian research administrator highlighted that research integrity documents can be supportive to researchers in subordinate positions, because the rules condemning this are 'written down':

> *It is a bit like oral tradition [research integrity documents], that it is like it is, you get the capability when you feel that the head of your research unit at the moment abuses you, when you see that it has been written down, this might not be the …best practice*

Estonian research administrator

A UK mid-level researcher also thought that it was helpful for researchers to have the general direction on integrity issues led by their institution:

> *I think it's handy if there is a general direction somewhere. I think we live and work in a big complicated institution, so it should probably be something that gets put down and that gets reviewed on a regular basis…*

UK mid-level researcher

It was highlighted by some that policies can be helpful for training students, because supervisors can refer them to the documents:

> *Still, such a master-apprentice approach that if we have PhD students we train them, based on our best practice of good research, and of course, it is great help if some good practices are worded so that sometimes I can tell the student, to take a look, if the code has such points, that it is helpful as a study material.*

Estonian mid-level researcher

Finally, the UK research governance advisors discussed how policies help direct and outline fair procedures for dealing with alleged cases of misconduct:

> *I think we've a clear reporting process that's effective when we have an allegation made. I think there's a level of objectivity and there's enough distance between the person who's investigating that alleged misconduct and the researcher that makes it effective… thinking through some of the misconduct allegations we've*

received, how they've been processed and then… the outcomes that have been found, its worked well I think… so far the misconduct process we have in place I think is working quite well and the policies help it rather than hinder.

UK research governance advisor

There was a small amount of discussion regarding what good policies should look like and how they should be developed. One Estonian research administrator thought policies should be developed according to a minimalist approach:

I am a minimalist, the less is more, but what is absolutely necessary, should be put in writing.

Estonian research administrator

it was reported that Italian research managers discussed the University Ethics committee for Human Research at their institution and concluded that the policy of ethically reviewing research work could be made better if submissions to the committee were mandatory.

Finally, UK research governance advisors discussed how policy development should be conducted in consultation with stakeholders to ensure that they are fit-for-purpose:

- …we go through a review process of all policies when we send them out to our stakeholders within the university to challenge them and say is this fit for purpose or do we need to make changes and I think that's a beneficial process.

- And we do exactly the same. Ours go out to various professional services and academics and we've got stakeholder groups for all of our policies.

UK research governance advisors

6.7.4 Fears of overregulation

In discussions about the effectiveness of policies, in all four Estonian groups and the UK senior researcher group the Italian research manager group, some participants voiced concerns about overregulation with regards to polices and regulations, and research ethics committees.

In some areas of research, it was thought that there were already enough policies and regulation:

Biomedical research is well regulated … I think all the principles exist quite clearly. There is no need to overregulate… All this has been regulated quite well.

Estonian professors

However, another Estonian junior research thought that there was no need for further policies, regulators or managers in the research system overall. Instead, it was thought that the system (especially Estonia) needed more individuals to get on with the actual research work:

There is no need for more precise regulations, no more regulations are needed, there is no need for more people who regulate, no need for more leaders, no more

people are in control, no more leaders are needed, no more chiefs are needed, we need more ordinary Indians, we need more people who do the actual work. Especially in Estonia.

Estonian junior researcher

There was a view by some that overregulation was not needed because the scientific system is self-regulating:

I think this is not an area where you need to overregulate, that I know that the university standards… If there is anything to support, then it is the self-regulating mechanisms of a scientific field, which work automatically a general perception of what's right and wrong.

Estonian junior researcher

Some participants voiced fears about regulation creep in science, with the accumulation of rare cases becoming incorporated into policies, and subsequently developing aspects that are mostly useless in everyday practice:

What I know about the emergence of laws, in most cases there is some specific case behind every act of law, this paragraph is written, because someone was caught up in this or that, and they want to rule it out [in the future], that it would not be repeated. And if this is the case that happened happens perhaps once in a hundred years, then this is a foolish law that put the daily routine in place, which only increases bureaucracy. The bureaucracy is creeping into science, where we have to spend a lot of time on nonsensical reports, sometimes on feedback, but this is related to regulations.

Estonian mid-level researcher

Furthermore, Estonian junior researchers warned that the Estonian system should not learn overregulation from others:

- And let's not learn overregulation from others.

- This too. Let's learn from others' mistakes.

Estonian junior researchers

The UK senior researchers raised concerns that development of policies can be helpful, but that also policies can be irrelevant and harmful. Furthermore, it was thought that development of policies can just lead to increases in superficial 'tick box' approach to integrity:

- …I can imagine it going both ways. It's one of these cases where actually the best- we can talk about these things in fairly, um, (pause) broad terms as we're doing now but actually for some areas whether or not they turn out to be useful, just irrelevant or harmful will depend upon the detail- the nitty gritty details.

- Because a lot of these things will end up as extra tick boxes on the full economic costing form or on the journal's submission form, I declare that I have read the declaration of Singapore…

UK senior researchers

Finally, it was acknowledged by participants in discussions of barriers to research integrity (see pressures above), that the process of obtaining research ethical approval can be burdensome to researchers. However, there were also some fears that this process can stifle academic research raised by Italian research managers and Estonian junior researchers. Referring to the actions of research ethics committees, Estonian junior had the following exchange, which suggests concerns about the boundaries of research ethics committee advice:

- This is where a grey line can come up soon, perhaps, if it gets a bit over the top, you will be told, that you cannot ask this question, this can create a feeling of discomfort in someone, although it can be quite a legitimate topic to investigate and this may not be sufficient reason for doing that, that you are told, oh no, do not ask, do not ask about political views because it is a too sensitive topic.

- You can feel little bit of harassed in the end, [if you are told] not to investigate this and it does not pay off to study that… so far, I have not encountered but there is quite a high risk, I agree with that.

Estonian junior researchers

6.8 Effectiveness of sanctions

Participants from all four participant groups were asked about their knowledge of sanctions at their institutions and what they thought about sanctions for dealing with research misconduct and violations of integrity. Three themes were identified: lack of awareness about sanctions, support of sanctions and scepticism regarding the effectiveness of sanctions.

6.8.1 Lack of awareness about sanctions

When asked about sanctions, many participants lacked awareness. For example, in reference to research with industrial collaborators, a UK junior researcher said he was unaware what the consequences of breaching his contractual agreement with the industrial partner would be:

I don't actually know what the repercussions are. Like I say if I published something, like a raw data resolution as opposed to a model resolution, would the company come and sue me sitting in the university, I'm not actually sure.

UK junior researcher

Perhaps surprisingly, UK research governance advisors were not aware of the sanctioning for misconduct or violations in research integrity at their institutions. They explained that their remit was to support rather than enforce, although it was mentioned that they might deal with minor issues directly with researchers. Thus, enforcement and disciplinary procedures are dealt with at a high level in institutional management structures:

- I don't know if [our] misconduct policy has specific sanctions but this goes to disciplinary procedures, so if there is a finding of, I don't know, research misconduct it will go through the disciplinary route- And a lot of those, as you

said, is delegated at school level and the supervisor will be- it might be a slap on the wrist, it might be well I'll have a look at your next paper but my kind of team that I sit within don't really see a lot of that and what really happens with it…-

- There's very much senior management stuff which the support people wouldn't get involved with. We're just there to support but not actually enforce-

UK research governance advisors

If something goes- if something minor goes wrong I think generally you try and sort it out one to one with that individual and he might get a little ticking off or something, but it wouldn't ever be you're going to be restricted from doing something but that's because I don't think we've seen anything that serious-

(general agreement)

UK research governance advisor

Research governance advisors also wondered if they might not be privy to information about misconducts that occur at their institutions, implying a level of secrecy that surrounds incidents of misconduct:

-intentional or unintentional and I don't know if there was something quite serious, I don't even know we would even hear about it-

-No.

-I wonder if it would be kept very quiet, you know, there might be things that have happened that we can- we're not aware of but- I can't recall of anything serious or penalties.

UK research governance advisors

However, they also questioned whether this apparent lack of awareness about incidents and sanctions is because there are few cases of misconduct that are reported and dealt with:

as an institution we just haven't had much experience of this and I think that's a problem generally worldwide is that there's just not that many allegations. That could be a great thing 'cos everything's going fine and dandy, but I suspect it's because a lot's not reported.

UK research governance advisor

In Italy lack of awareness regarding sanctions was also reported: junior researchers apparently stated that there was a departmental delegate to deal with plagiarism, however it was not clear to whom allegations should be reported, or how the delegate would deal with the case or impose sanctions. It was also reported that junior researchers believed no-one explains to students what misconduct is. In the mid-level researcher focus group, it was reported that cases of plagiarism are dealt with by individual supervisors and there is a lack of control and care whether this is done or not. In the senior researcher focus group, participants said there was a general lack of awareness of the institution's

ethics code, and it was not clear who is responsible for ensuring that sanctions in this code are enforced. Finally, Italian research managers were reported as stating that there was a lack of clarity regarding how the institution deals with reported cases of misconduct and sanctions.

6.8.2 Support of sanctions

There was some support of sanctions amongst participants, because it was thought that they can make a striking impact when applied, as demonstrated in the following story recollected by an Estonian senior researcher:

> *I want to tell a story, to support the idea of the sanctions. When I was a BA student, we had practical assignments and my supervisor was a professor and then I wrote an interpretation. The mistake that was there was that I found a result that I did not comment because I did not know how, what to do with it, I thought it showed nothing. My professor wrote in capital letter "YOU LIE," you do not interpret this result. This was enough, I never again… I think the pedagogical moment is very important there. I think there should be sanctions. Part of the training to be a scientist should be an understanding that you have no place in the community if you do not take it seriously what you want to get from there.*

Estonian senior researcher

However, participants also tended to think that whilst punishing people should happen, this should not form the foundations of compliance. Instead, it was suggested that institutions should focus on supporting researchers to do good practice:

> *Of course, I am not against punishing people, but still… Still… No, I do not have anything against it, but I believe that one as a basis should focus on building what one wants. If one gets unlucky after having really worked on building good practices – I think one should use punishment. However, I think punishing wrongdoers is a too infirm basis. As an institution, one needs to be responsible and help people I think*

Norwegian research administrator

6.8.3 Scepticism regarding effectiveness of sanctions

Italian research managers were sceptical about the effectiveness of sanctions because in practice there is no-one checking things (such as data) to detect cases of misconduct, implying that very few cases get investigated:

> *What are the tools to detect misconduct in research? Yes, there are sanctions, but how can I identify who is falsifying data? It's extremely difficult if I do not have access to the data, if there is not anyone checking that data*

Italian research manager

UK research governance advisors were also sceptical about the effectiveness of sanctions in dealing with unintentional violations of research integrity. There were worries that sanctions could deter researchers from reporting incidents where mistakes have occurred. Instead it was thought that

institutions should foster an environment where researchers to feel able to be open about mistakes without fear of retribution. Thus, developing a system of dealing with research integrity problems that is preventative, by learning from mistakes.

> *I think it's also important- what you want to ensure is that people feel- willing to come forward if something goes wrong and I don't know if sanctions are necessarily the best way to encourage that, you know, and that's where you make, and I may be wrong here, but you may force people to try and sweep it all under the rug rather than the openness to come forward and say look I've made a mistake, how can we fix this and like you were saying, what we probably try to do is ok, we've done- this has happened, how can we fix it and what can we do to prevent it so it doesn't happen again and I think that's more beneficial personally…*
>
> *UK research governance advisor*

Summary

There was variety in the level of knowledge and awareness of policies, but on the whole, there was not a great deal of awareness. There was a stark contrast between Italy and the UK in terms of regulation. In Italy there was a distinct lack of policies relating to research integrity, while in the UK there was a wide array of policies covering a broad scope of research integrity, to the extent that participants commented on there being an information overload problem.

The main challenges reported were that policies can have limitations and be ineffective due to content and implementation, research culture is important in embedding policies into practices of researchers. However, policies can be helpful to raise awareness and put integrity on the agenda, within teaching, and can promote fair practices.

There were fears of overregulation, and concerns that policies can be bureaucratic and unnecessary, with committees sometimes stifling academic freedom. Some participants held the view that science is already self-regulating.

There was lack of awareness reported in the UK and Italy focus groups regarding sanctions at institutions, for example in terms of how different acts of misconduct are punished. Furthermore, in Italy there was lack of clarity regarding the processes of reporting incidents, including who was responsible for imposing sanctions. Some researchers who thought sanctions had a function in dealing with misconduct expressed some support for sanctions. However, sanctions were not necessarily viewed as the main foundation for preventing misconduct and violation of research integrity. There was also some scepticism regarding the effectiveness of sanctions, because there are not sufficient monitoring systems to detect potential cases of misconduct. It was also thought that that sanctions could potentially act as a barrier to open reporting of mistakes that breach research integrity.

7. Research integrity education and support

Overview

Questions about research integrity education and support were posed to researcher participant groups only and responses to these questions were only partially reported by Norway. Of the reported data, three themes were identified describing how participants learnt about research integrity: explicit learning, implicit learning and learning concerns.

7.1 Explicit learning

One aspect of learning about research integrity identified by participants was that it is often explicitly taught by institutions from undergraduate level:

> *- [The university] still supports to some extent. People are still taught how to cite properly. It is taught already from the BA studies onward. Supposedly also senior colleagues give you feedback and they, they, do that differently, I could say that at least partially it supports. The structure is there.*
>
> *- You are also taught how to evaluate repeatability and how you should plan your experiment and, in that regard in general, you are provided with knowledge in almost all these things*

Estonian junior researchers

It was reported that in the Italian junior and mid-level researcher focus groups, due to the lack of training provided by the institution, researchers resorted to self-supported explicit learning, i.e. learning on their own by using books.

UK junior researchers reflected upon how explicit learning tends to happen early on, but then learning moves on to becoming more implicit:

> *I sort of think- learnt from school onwards how to kind of cite, you know, kind of quote from texts and then cite, ensure always kind of cite, kind of credit or reference, you know, ideas and I suppose that was kind of drummed into me explicitly but- and since then, yeah, less- its more, yeah, more implicit since then.*

UK junior researcher

7.2 Implicit learning

Many researchers from across all countries described how their learning about research integrity was implicit, through role models and interactions with others in the course of their work. Becoming an academic researcher was described by one UK senior researcher as doing an “extreme apprentice”, and many participants thought that much of their learning about research, including integrity has been through practice:

> *I felt that it is kind of something that I pick up a little here and a little there. But it was good to have courses in methodology here also. And I feel like I learned most by working with it by myself. Yes. In practice frankly.*

Norwegian junior researcher

Several participants likened this process to children learning values from family members:

> *[Your] supervisor is the first, and the whole environment where you become a scientist, how your role models behave. I think this is the main thing, for me it*

> *was. And then the cooperation, internationally or in some other groups… you can learn other values… As I learn values from my mother, grandmother, father as a child, I learn scientific values from my own colleagues and those who I consider authorities.*
>
> *Estonian senior researcher*

Discussions and experiential learning were viewed as powerful by some participants because they can have direct relevance. One of the UK junior researcher expressed how incidents of misconduct can be helpful in learning because they generate interest and discussion.

> *A lot of it I think I just picked up implicitly not even necessarily from within the university but also from reading books- things that occur in the news. I mean one of the things that I find- quite a good example is that a few years ago there was this professor that turned out he'd faked all his data… that disappears from the news and I guess a discussion going on the integrity of science in general… well this discussion makes me aware of how much of research integrity is kind of assumed to be implicit knowledge or assumed to be aware of anyway 'cos I- to be honest I can't remember any lectures that I've had on research integrity as such, only about quality of data for example.*
>
> *UK junior researcher*

Another UK junior researcher highlighted how the process of submitting one's research plans through a research ethics committee for approval can be helpful to learning, because it makes researchers really think about the ethics and integrity of their work:

> *I think some of it comes from people who work within like ethics and ethics departments so, you know, most universities now, when you're kind of setting up a study you need to get ethical approval and you should have consent and, you know, you're thinking about anonymising data and thinking about what your data's going to be used for so I think some of that is kind of forced onto us. It's good that it's forced onto us, for the right reasons.*
>
> *UK junior researcher*

7.3 Learning concerns

A number of concerns about learning were raised. It was reported that Italian junior, mid-level and senior researchers were all concerned about the lack of training about research integrity and ethics provided by their institutions, particularly for students and new members of staff.

Another concern discussed by UK junior researchers was that learning about research integrity early on may not be relevant to students and therefore, may be somewhat ineffective.

> *…I'm pretty sure I got lectured on it at undergrad, I'm pretty sure I don't remember any of that because at that point that's not what you're interested in, so you do enough to get by but none of it stuck.*

UK junior researcher

An issue raised in several focus groups across the countries was the concern that there can be inconsistencies in teaching or training about research integrity by supervisors, because they can have varying skills and understanding in this area:

> *…the other aspect of responsibility to PhD students and post-docs which is also responsibility to not only for their career but the training in the right way, including these issues that we're talking about and, you know, some of the PhD supervisors or probably, you know, team leaders are better than that than others along with other aspects that they're better at or more skilled at.*

UK senior researcher

Finally, one Norwegian junior researcher reported that as a student despite learning about good science, incentives did not necessarily concur with what was being taught:

> *I feel that people kind of… were rewarded for being creative and rushing through things, but I go very little reward for focusing on accountability*

Norwegian junior researcher

Summary

Researchers described how they learnt about research integrity explicitly, through institutional training, and implicitly, through practice and role models. There were a number of concerns about learning. Some participants complained that there are no explicit training courses; where explicit training does exist, it may not be effective if delivered too early to be relevant to the researcher at that time; and training can be inconsistent between students because of the different skills and abilities of supervisors.

8. Promoting research integrity and researcher needs

Overview

The discussions regarding how research integrity can be promoted, and what researchers need identified five themes: systemic changes, building a positive research culture, improving researcher working conditions, training and practical tools. Suggestions made by researchers in these different areas are listed below. Of these five areas, most prominent across all focus groups was the view that to effectively promote research integrity, it is essential to "build it into the culture". Furthermore, in all but the Estonian focus groups, participants thought that it was essential to provide effective training to research staff, some focussing on early researchers and others stating that training should be at all levels. This is consistent with the Nuffield Council on Bioethics' report on research culture. "Sixty per cent of survey respondents think that initiatives that promote integrity in science in the UK, such as codes of conduct, are having a positive or very positive effect overall on scientists in terms of encouraging the production of high quality science." … [Participants suggested that universities] have a responsibility to create conditions to support ethical research conduct and demonstrate clearly the consequences of poor research practice." (Nuffield Council on Bioethics,

2014, p.30). Training in good research practice was thought to be important in this regard, particularly for PhD students, but time pressures on senior scientists might be preventing this from happening at the moment. Universities might also be more open about how individual cases are resolved. The efforts of academic publishers to tackle issues around authorship were praised, although some thought they should have stronger policies on dealing with retractions." (Nuffield Council on Bioethics, 2014, p30).

8.1 Participants' suggestions for systemic changes

It was evident in discussions about misconduct and poor research practices (section 3) and about barriers and challenges to research integrity (section 5), that the current research system is influential to research integrity. Participants from focus groups conducted in all four countries had suggestions for ways in which the wider research system could be adapted to help promote integrity. These suggestions mainly focussed on potential changes to research funding evaluation and incentives as well as the publication system. Participants in some groups also made proposals about how research integrity could be dealt with at national level.

Regarding research funding, one Italian junior researcher was reported as stating that the research system could be improved if more funds were allocated to scientists to repeat experiments. This suggestion related to research integrity in terms of doing good research, and the problem of replicability. However, there were also suggestions of ways in which evaluation of research should be conducted to distribute funds. Estonian senior researchers spoke about how the evaluation system may be acceptable in some respects, but thought it could be improved if evaluation was more sensitive to disciplinary differences and ensure that funding is allocated across disciplines:

> *- Maybe we get to this that it is not bad per se the system through which we are evaluated, but perhaps all these [disciplinary differences] should be taken into account in the distribution of bonuses… I take an analogue from educational system there are many people with different backgrounds … we have to approach individually. We do not have to count that everybody will be at the same finish line and then evaluate who they are. But this approach would be different.*
>
> *- In many countries [scientific financing] has been divided up. You have a science fund for natural sciences, for medical sciences, humanities and the state gives to each…*
>
> *Estonian senior researchers*

Estonian senior researchers also spoke about whether it was realistic for researchers to think they could change current evaluation systems, with reference to recognition of publishing outputs of researchers. Here, one participant thought it was not realistic to change the system *"from the outside"* (indicating that this was not thought to be under the control of researchers), and instead it is perhaps better that the research community should alter its attitude to different modes of research outputs and not accept unfairness of the evaluation system:

> *- But I have a complicated question, what do you think, what is more reasonable to change – either how the [evaluation] indexes are calculated and what can be published in magazines or rather the attitude of the scientific community towards it.*

- Yes, rather so. I do not think we have to change the indexes of the journals; we cannot do it from outside. But the attitude of the scientific community should be… it also comes to where we publish, which articles count. These are different in social sciences, humanities. I think the differences come out.

Estonian senior researchers

It was reported that Italian research managers discussed the need for a shift towards emphasising quality over quantity in evaluation of researcher outputs and one of the participants proposed that research institutions had some power in this:

University has a strong responsibility in the evaluation process [for selection of researchers] [and] it would be very easy to intervene.

Italian research manager

However, as discussed above (in sections 3.5 and 5.1), Estonian research administrators and Italian research managers viewed the current system as an improvement on past systems and were unsure about how the current methods of evaluation could be improved. One of the UK junior researchers thought that academics should be evaluated not just on numbers of academic publications, but also other types of dissemination work such as public engagement should also be appreciated in evaluation of academic career progression:

I personally think that what would be helpful to increase research integrity would be… I think a lot of making progress in your career is still based on the number of publications and I think looking at more other things, if there are other things in terms of outreach that would substantially add to your career perspectives that would be very helpful because I think that would get research out there to the public that wouldn't necessarily read papers… I'm very much in favour of these other ways of generating impact and outreach but should those be reflected in your career, in your job prospects.

UK junior researcher

Making reward systems and incentives compatible with promoting integrity was also discussed in other focus groups (UK senior researchers, Norwegian research administrators and junior researchers). One of the Norwegian research administrators had experience of working in the UK and reflected upon how research ethics was promoted there because it was made a component of research funding:

The way they [people in the UK] told it to me, was that it was money, which back in the 50s pushed ethics forward, put it on the agenda… the funders, did not at all want to spend their money on something that was unethical.

Norwegian research administrator

Indeed, in another Norwegian focus group (with junior researchers), one of the participants thought that research integrity should be a "tellekant", meaning something that is quantified and measured in academia, and often used as a foundation for distributing funds:

> *Make integrity a "tellekant", if we need to have "tellekants". They are saying the same about lecturing as well, if you do not make lecturing a "tellekant" nobody will bother with it.*
>
> *Norwegian junior researcher*

Participants from some focus groups discussed how they thought the publication system could be improved to promote research integrity. It was recognised by some participants in the UK and Estonian senior researcher focus groups that academic publishing is 'big business', with financial gain perceived as a central motivation for some publishers. Therefore, the publication system was viewed as not necessarily functioning in a manner that promotes integrity and, potentially exploitative of academic researchers. To help resolve this problem, one of the Estonian senior researchers reflected upon individual actions taken by some scientists to break-up the financial monopoly of academic publication businesses by boycotting certain publishers. Thus, suggesting that researchers could take individual action to attempt to alter the system:

> *That is a very interesting topic [improving the publication system] … for me it seems that this can be developed further a lot. One that I remembered is the scientific publishing houses that make big money, against what the scientists have protested, e.g. in US the big state universities have said that they do not publish in Elsevier journals because these are oriented to profit beyond reason, the scientists are practically working free for them, this is the question of pure ethics, if you find that people are abused.*
>
> *Estonian senior researcher*

As discussed above, the bias towards publishing positive results and pressures to publish were identified by participants as challenging to research integrity from across all four countries. This issue was highlighted by one of the UK junior researchers when thinking about ways to promote research integrity. It was thought that moving away from focussing on positive findings and numbers of publications could solve many research integrity problems such as the 'replication crisis' and biases in published academic literature that can affect scientific development:

> *Personally, I think so many problems would be solved if we let go of that whole focus on finding something significant. It leads to hacking your way into the statistics to get- or that are actually from a statistical point of view aren't even that meaningful and it creates a massive bias in the literature as well which maybe is not only a problem for us as an institute but also for research as a wider thing and its led to crises in different disciplines, replication crisis etc, etc. so I think so much- there's so much problems that come from that publication bias and that push to publish.*
>
> *UK junior researcher*

Concerns were expressed in some of the focus groups (UK junior and Estonian senior researchers) that retractions and errata are not always clearly identified in published materials. To remedy this, one of the Estonian senior researchers thought that it would be a good idea to make a general standard that retractions are very clear on published journal articles:

> *…is something possible to do technically in the scientific world, that is a standard – is that the articles that did not get through the "community peer review" after the publication, if problems have occurred, there is retraction. That this would be a general standard, that it will be on the pdf, everywhere, there is a big stamp on the title page: look, this has happened to the material.*

Estonian senior researcher

Finally, there was some discussion about peer review by UK mid-level and senior researchers and Estonian senior researchers. In the UK the focus was about whether peer review should be anonymous or un-blinded, where there were some differences in opinion. Some researchers thought that un-blinded peer review, where reviewers are identifiable could be a change that would promote integrity because it was thought that it could make peer review fairer (avoiding problems of bias, or exploitation of the system discussed in section 3.1). However, others thought that peer review should be anonymised (double-blind) to protect the reviewers, particularly relevant for less senior researchers. Nevertheless, it was recognised that anonymised peer review has limitations because researchers (especially in small research fields) may be able to deduce the identity of reviewers. These differences in opinion about peer review are demonstrated in the exchange between UK mid-level researchers below:

> *- One way [to deal with problems of unfair peer review] that is done at the moment where the reviewers' names are published in certain journals, so (journal) is doing it, at least in our fields.*
>
> *- Which I've not consented to on several occasions 'cos my feeling there would be that if someone wishes to have a personal vendetta, my career is not secure enough yet to survive that. I'd have been happier if double-blind, but I don't think double blind works in my field 'cos we all know each other, and we can recognise someone's style of writing generally.*

UK mid-level researchers

In the Estonian senior researcher focus group, one of the participants wondered whether allowing post-publication review, where researchers can comment on open-access published research might help promote research integrity because it facilitates the self-correcting mechanism of science. However, they were also sceptical as to whether this would work in practice due to the time constraints of researchers' work:

> *To look at to variants where one works, and the other does not, for me there is nothing theoretically wrong if you have an open access article and this is opened for comments. The idea could be that if somebody finds something stupid, then they write a comment or an article, but taking into account the real time pressure these things will not usually work. It is an idea that is theoretically right but does not work.*

Estonian senior researcher

In terms of promoting research integrity at a national level, participants in focus groups from all four countries raised a number of issues and ideas. In the Italian research manager focus group, it was reported that one of the participants voiced concerns about the effects of an 'unsettled' national regulatory framework upon research integrity. This individual thought that it was essential that *"the*

regulatory framework did settle, in order to give clear messages [and] to establish good practices". Moreover, the role of politics in promoting research integrity was discussed in the Norwegian senior researcher group, where one individual thought that to improve the material conditions for research institutions, politicians needed to have good attitudes to research ethics:

> *… since we are so many researchers in this country I think our politicians should have good attitudes when it comes to research ethics – that is, it has to have an effect on the material conditions for the research institutions*
>
> *Norwegian senior researcher*

There were also thoughts about how collaboration could potentially promote research integrity. In the Estonian mid-level focus group, one participant proposed that it might be beneficial to develop a common understanding of research integrity by bringing together different stakeholders (e.g. researchers, funders, administrators), who come from different perspectives to discuss things and work out ways to improve the research system. However, this participant also wondered if this idea was too idealistic, and may not work:

> *It seems to me that the most important thing is to get the different groups that are involved in this topic or for whom this topic is important, how to get these different groups to communicate with each other... Thus, in this sense, we can discuss in good faith on these topics, but somewhere there is a decision that is made a little bit differently and how to get all these different parties around the same table, that they would really discuss these topics substantially and with clear heart to find a way to make it better. It seems to me that everybody is in their own corner and the communication is partial and often problem-based, but it is a little bit too fragile. But perhaps I am an idealist in the sense that maybe that is not possible at all.*
>
> *Estonian mid-level researcher*

Talking about the current UK situation, one of the UK research governance advisors highlighted the importance of collaboration across institutions to promote research integrity. This individual expressed disappointment in the loss of the Association for Research Ethics Committees that provided a forum for people to discuss issues across research institutions, and hoped that this engagement could be re-developed by another organisation:

> *I think it would be more around how we can work collaboratively in promoting research integrity across institutions. I know- it's unfortunate I think the Association for Research Ethics Committees has recently folded and ARMA [Association for Research Managers and Administrators] is supposed to be taking up the training requirements for research ethics integrity but I think that forum having been lost is a shame so perhaps if there could be a push to again get something similar where there's that engagement across all the UK wide institutions and, research integrity could maybe exist on there, that also help.*
>
> *UK research governance advisor*

Finally, it was reported that Italian research managers thought that public reports of activities of the institutional Ethics Commission (and presumably also those of other similar committees), who deal with misconduct, could be a helpful in promoting research integrity, although it was not detailed how this could be beneficial.

8.2 Participants' suggestions for building a positive research culture

Building a research culture that is positive about research integrity was an issue highlighted as particularly important in many of the focus groups across all countries. Many participants thought that to promote research integrity, we need to *"build it into the culture"* (Norwegian research administrator). It was reported that the Italian junior researchers thought that part of developing a culture of research integrity within research institutions is to ensure that rules are cogent and respected by researchers. This view was echoed by a Norwegian research administrator, who thought that clear guidelines and messages by institutions were important as well as training:

> *Well, clear guidelines, obligatory courses, and... Clear guidelines and clear messages about how the institution looks at it…*
>
> *Norwegian research administrator*

However, whilst clear rules and guidelines were recognised as important in other focus groups, there was some discussion regarding potential limitations to rules and guidelines. In the UK mid-level and senior researcher and research governance advisor focus groups, there was concern that 'top-down' imposition of rules, developed without adequate consultation with researchers could be problematic and unhelpful. Indeed, one of the UK research governance advisors thought that increased consultation in the development of policies and training was a very important thing that could be improved in institutions:

> *I think what doesn't work, or certainly what researchers feel doesn't work, is when professional services impose things and polices in, so I think actually engagement and consultation is the biggest thing institutions can do better. If we're going to get senior academics, junior academics, whatever the group may be and saying what do you need and that's what we're trying to push at the moment at our institution is a lot of engagement and we're trying to come up with initiatives that are needed rather initiatives that we get on reading the [UK] concordat and saying well actually this might be helpful, let's implement that, let's actually try and work out what the need is.*
>
> *UK research governance advisor*

As described earlier when defining research integrity, many participants highlighted that different disciplines may have different requirements (see section 4). Thus, in discussions about promoting integrity, there was recognition by some researchers that rules or policies implemented by institutions need to be mindful that there is a 'one-size-fits-all' approach will not work:

> *I do not believe that thinking of a procedure or a norm that applies to all disciplines is possible.*

Italian research manager

Instead there was some discussion that disciplines may need to be to develop some of their own rules that specifically meet their needs. This issue was discussed by UK mid-level researchers who thought that if development of rules and procedures are 'community driven', then they would be better respected and adopted by the community:

> *I think if it's actually community driven and people have engaged with the process and it has been people we respect, and trust and it gets regularly reviewed then you have a much higher chance of seeing an engagement with it than if it's just well we've given you some guidance, now go forth and be good.*

UK mid-level researcher

Moreover, there was a view that creating a sense of community would be beneficial to promoting research integrity in younger generations of scientists/researchers, because it was thought that they would feel that they belong in the community and adopt the shared values of the community:

> *there is a lack of a community so I think that in terms of research integrity creating that sense of community, you are scientists, you belong to the community of scientists and then it has become- it has to become a shared values, if you make, you know, integral in what you do, so if we are able to instil into the younger generation that aspect as a shared value so that, you know, you feel you're belonging so that's the way forward I would say.*

UK mid-level researcher

One of the UK mid-level researcher participants also suggested that researchers could set *"community standards"* on certain issues such as reproducibility. It was also thought that this sort of approach to standards setting could increase discussion amongst researchers regarding what is acceptable in research:

> *I think for issues such as reproducibility it might well be that it would be useful to develop a community standard, and I'm sort of thinking along the lines of the Good Housekeeping Institute or Good Food where everything is triple tested for example. That may not be financially viable but it might be useful if there was a common standard adopted by people for saying well we want to see evidence that you've done x, y and z in this particular area and again that would also be quite a useful way of starting a dialogue with people, about what is actually appropriate in this area and how does it evolve over time and once journals start fostering that and once those sort of questions are being asked then people tend to take notice.*

UK mid-level researcher

In addition to clear rules, clear and effective sanctioning of bad behaviour was also discussed. Whilst some participants had voiced concerns about the limitations of sanctions as effective and beneficial

to promoting research integrity (see section 6.8.3), there was also some support of sanctioning (see section 6.8.2). Thus, in discussions about promoting research integrity, the importance of sanctions was again highlighted. A number of individuals described how it was important that sanctions should be enforced (Italian junior, mid-level and senior researchers; Estonian junior and senior researchers).

> *…for students the [rules] are in place. When a student plagiarises, he is out. Well, I imagine that it should be similar to the researchers that if you plagiarise or fault in a bad way, there is not much room for forgiveness. Maybe the first time you will be forgiven, but the second time if you do something wrong, it cannot be your job or hobby can that you do something wrong.*
>
> *Estonian junior researcher*

However, one of the Estonian senior researchers who advocated sanctions was unsure about what sort of sanctioning would be considered fair and adequate to deal with cases of misconduct or poor behaviours:

> *I have picked up from economic theory that sanctions are a very important theme. These do not sound popular, but sanction are things that prevent people from doing certain, ethical mistakes I have a personal experience when my… not just my idea but my work was published by another person, not form my department, from another. I was a young scientist and I got such a shock from that I thought I will leave university. There were obviously no sanctions, I do not know what is fair. I really do not know. But we need something.*
>
> *Estonian senior researcher*

Whilst the recognition that clear rules, standards and sanctions are a fundamental part research culture that promotes research integrity, participants also emphasised that developing a positive research culture needs to go beyond rules and policy. It was reported that one Italian research manager highlighted that there should also be a focus upon individual responsibilities to ensure research integrity. However, participants also discussed culture in terms of the collective. As one Italian senior researcher stated, 'subtle' aspects of the research environment and attitudes of co-workers to research work are also integral elements of developing a culture that is positive to research integrity. Thus, as well as policy, institutions need to ensure that 'virtuous behaviours' are encouraged:

> *…one begins to do research in a laboratory, he climbs the ladder… but there, how is he exposed to good, ethical practices of research? How is he exposed to bad practices? This is more subtle than the existence of rules and procedures; it invests more the underlying culture that exists in the environment in which one operates. So, if in a department there is a certain way of working, one is influenced by that way of working. If there is a tendency to let it go or, let us not say encourage, but to not discourage certain attitudes of utilitarianism in doing research in a certain way rather than in another, then there is a risk of an improper development of research practices. I think that what counts on the one hand is the regulatory and informational effort, but on the other hand it is also important that, within the university and the departments, there is always someone pushing towards virtuous behaviours.*

Italian senior researcher

Indeed, one of the UK junior researchers thought that research teams with a positive approach to promoting research integrity could be helpful for individual researchers and could even build some resilience to external pressures faced by researchers:

> *I think I could imagine being part of a research group which has a very healthy approach to research integrity would be massively helpful, so I think… I think if we all have that as a focus of that group then it's a very- then it also becomes easier to create a momentum to withstand some of the external pressures we're facing that might compromise research integrity like for example publication, push to publication, publication bias etc, etc.*

UK junior researcher

Furthermore, one of the UK senior researchers stated that rather than increased rules, research integrity should be promoted by taking practical steps to facilitate researchers to conduct better research:

> *I think going back to what we need, I think the more practical the better. We don't need more sort of directives or- we just need people coming to talk to us, speaking our language and trying to in the end help us do better research.*

UK senior researcher

Participants from a number of focus groups expressed how they thought that raising awareness and competency in research integrity across different levels was an important aspect of building a culture of integrity. It was reported that participants in the Italian senior researcher focus group thought that awareness about integrity policies and good practices was particularly important for research leaders who could them promote this amongst their team and look out for any problems. Indeed, the importance of engaging senior researchers was also mentioned in the UK mid-level researcher and research governance advisor focus groups. Senior researchers were viewed as powerful actors with the ability to promote or hinder a culture of integrity:

> *It's got to come from the top as well. The problem we have when I do sessions with postgraduates and PhDs and I tell them about all the best practice, whatever it might be, the comment I always get back is there's a power imbalance and ultimately if I as a postgraduate get told that they're going to be put first on the paper how do I approach that so we almost need to really make an effort to engage with the senior academics so that it filters down, that kind of cultural message.*

UK research governance advisor

In the Norwegian senior researcher group, a participant described how research administrative and support staff should also have an awareness of research more generally, including research integrity to facilitate researchers to conduct good research:

> *If those who are associated with the project in an administrative, supporting or controlling function do not understand what research is, then our conditions for doing research become very bad.*

Norwegian senior researcher

One of the UK mid-level researchers thought that raising everyone's awareness was an important first step in promoting research integrity and dealing with challenges:

> *…first is the awareness, so if we make everybody aware that, I mean these are the reasons why people make the decision not based simply on the science then as everybody's aware of that because everybody probably know but it's not spoken about and then awareness eventually will bring us to ways to tackle…*
>
> *UK mid-level researcher*

It was reported that participants in the Norwegian senior researcher and Italian research managers focus groups identified having a culture that approaches research with openness and transparency was important to promote integrity and that this *"concerns the whole research process"* (Norwegian senior researcher). Indeed, open discussion about research integrity was highlighted as an important aspect of building integrity into the research culture across focus groups in all four countries:

> *It [research integrity] should be talked about more I think openly*
>
> *UK junior researcher*

A participant in the Norwegian mid-level researcher focus group suggested that discussions about research integrity should occur within and between departments:

> *It is about debating it I guess, in a bit of a systematic way maybe. This about research integrity. Both within departments, but also among them.*
>
> *Norwegian mid-level researcher*

It was recognised by some participants that discussions about research integrity amongst researchers have the potential to help break down barriers that may be present due to academic hierarchies. For example, one of the UK junior researchers described how research group meetings as a PhD student were very effective for this. This individual thought that aspects of research integrity relating to good research practices could be 'naturally' conveyed in this way:

> *I would say small groups of research groups are very important and what I found most useful in my PhD, so our research group was tiny but then we would have weekly meetings with some other research groups where someone presents and that helped break down the boundaries between the students and the more senior researchers and you get to know them properly. Some students when they start are sort of terrified of presenting to more senior researchers but if you can break that down a bit and be more open with them you get so much more knowledge 'cos there is a huge amount of knowledge in these people and you just pick up stuff that you didn't even realise and, yeah, then things like good practice in research sort of naturally follow through.*
>
> *UK junior researcher*

The benefits of group meetings involving researchers of different levels of seniority was also recognised by UK research governance advisors:

> *I think that also helps culturally as well, enhancing a research culture within a group, particularly if it's a senior academic or staff member talking to the-*

exchanging ideas with an early career researcher, it just- it generally helps the atmosphere as well.

UK research governance advisor

In thinking about ways to promote research integrity, UK junior researchers also described from their own experience, how group discussion amongst researchers about their work encouraged feedback and communication about ways in which research could be improved (again, thinking about research integrity in terms of good methodology). As exemplified in the following exchange, these junior researchers described how helpful these sorts of group discussions can be:

-…sort of work in progress seminars, the way you don't have to have a result, you know, you've not giving the paper at a conference where you're expected to have a result, but you can just talk through some of the questions that you've been asking yourself and have those kind of more regularly maybe. We have them.

- We have some like similar, yeah, in (department), we've got them in research- overarching research groups and then they could be sub-divided in this and that and at a sort of like most niche level one of the groups uses the model that we use, because there's so much to it that very few people actually really understand it from top to bottom and its really- it is actually really useful,

UK junior researchers

Moreover, one participant from the UK junior researcher focus group thought that regular discussions or meetings could be a good way to remind researchers about important issues and reinforce standards:

…it's useful to just make sure its repeatedly brought up because it's something that, you know, when you're under time pressure from stuff you're just doing what you're doing and unless someone reminds you there's things on the broader picture that you should be taking into account you forget, so periodically like reminders which things like meetings and your department discussions with colleagues can bring up, it's probably about the most useful, once you know what you should be doing.

UK junior researcher

However, although discussion was viewed positively, there were also some reflections about potential limitations. For example, one of the UK mid-level researchers expressed concern that pressures faced by researchers in their work environment could also potentially act as a barrier to open discussion about integrity issues, particularly problems that could affect their work outputs:

The issue we've come across a lot are the pressures and I think that area probably needs to be quite carefully designed and defined as well. If you put people under intense pressures that are focused on output measures then it becomes much, much harder to create a culture of openness and people discussing when things don't work and what the problems might be.

UK mid-level researcher

UK research governance advisors were not convinced that all researchers would feel safe being open about their mistakes:

> *I know there was one researcher who published his CV of failures at one point to try and make this point, but people need to be quite open about their mistakes so if everyone was like that that would be great for our research integrity but we're not there yet.*
>
> *UK research governance advisor*

Another element of developing positive research cultures identified in focus groups from all four countries is the provision of adequate support of researchers by institutions. This issue was particularly important in the Norwegian focus groups where many of the participants were researchers involved in commissioned research. Therefore, dealing with external funders with potentially different agendas in terms of the research outcomes and conduct. One Norwegian senior researcher described the importance of having strong research leaders so that researchers could have sufficient support in difficult situations to ensure that research integrity is maintained:

> *… we as individual researchers have a responsibility to report to the leadership when we are unable to handle all the things we have to handle. Because that is something that happens. And then we depend upon meeting a leader that listens and understands, and improve the material conditions or allows you to decrease your contribution or contributes to preserving the integrity one needs to preserve both as an individual researcher and as a department.*
>
> *Norwegian senior researcher*

Leadership in departments was also identified as important by UK mid-level and senior researchers, who thought that departmental or research team leaders should lead by example. They also valued good role models:

> *I believe in sort of the role model, the leading by example…*
>
> *UK senior researcher*

Indeed, the value of role models was also discussed in the UK junior researcher focus group. One participant described how they found openness of senior researchers beneficial and thought that it would be a good idea for institutions to make efforts to encourage senior researchers to have good practices with regards to integrity (this also links to the comment by the Italian senior researcher above who described research culture as going beyond rules, stressing the importance of the research environment):

> *…just in general if you see someone more experienced than you being open and honest about what they don't know and their insecurities in what they're doing or their research, like that's really, you know, setting an example which is good, to know. If you start at high levels encourage more senior people to do it then presumably it will filter down because that's, you know, who you use as role models.*
>
> *UK junior researcher*

However, there was also some discussion in the UK senior researcher group about who could be considered a suitable role model. One researcher thought that one can be a good scientist but not necessarily act with integrity, meaning they are not a good role model, however another thought that it was unrealistic to find individuals who can be role models in all aspects, which perhaps also has similarity with discussions about research and researcher integrity (see section 4.1) by Italian mid-level researchers:

> *-I think the difficulty that we have is not so much the tools but role models. The question is, is it really easy to identify great scientists who have manifested great integrity? What is the overlap between the great scientists and the scientists who have got a lot of integrity and the problem is that there are many great scientists who do not fall into the integrity bracket…*
>
> *-It's naïve to expect that everybody, you know, becomes a role model 100% and we need to copy everything that they do.*
>
> *UK senior researchers*

Mentoring was another element of support for researchers that was highlighted as potentially useful for promoting research integrity in students by UK mid-level researchers. It was thought that mentors need to be chosen correctly so that they can understand their mentee:

> *Mentoring might help, if students can have a mentor they can actually relate to and mentors have to be chosen properly.*
>
> *UK mid-level researcher*

However, mentoring was also discussed by UK junior researchers in terms of barriers and challenges to research integrity (see section 5), where one participant described how they had less contact with their mentor post-PhD. Suggesting that it might be helpful if mentoring is implemented beyond student researchers.

Members of the UK research governance advisor focus group discussed how in their work it was helpful to engage with senior and mid-level researchers to act as *"research integrity champions"* in their departments. These engaged researchers were viewed as important because they could support the work of administrative staff responsible for supporting research integrity, but from the perspective of researchers, which was thought to be more effective at 'getting the message across':

> *I think demonstrating to your research community the benefits of engagement and how it will help them in terms of funding their publications and underpinning their research that they're going to carry out for themselves. I sort of touched on this earlier on and it's, the term's a bit cheesy but there's sort of your research integrity champions and you can lead them to academics who do currently engage but they need the sort of advertise importance of it when they go out and speak to their colleagues and their peers in team meetings and emphasise the importance of it because they speak their language they're able to get that message across, probably much more clearly than what I ever could and I think would be a good benefit.*

UK research governance advisor

However, the research governance advisors also warned that institutions should be careful not to overburden engaged researchers, because they effectively take on work to promote research integrity (such as consultation or educating others) in addition to their academic work which is already highly time pressured:

> *- we have some fantastic senior academics who really do and I think it just goes back to one of the earlier points is maybe we sometimes become too over reliant upon them and then that's one of the issues as well we're asking an awful lot from those who do engage and then of course, you know, you run the risk of losing them because they just don't have the time and they feel like you're overburdening them, so it's trying to find that balance I think. Certainly, one of the trickier aspects of it.*
>
> *- It's true. Those that engage tend to be the ones you use as champions, or you go to as part of a consultation and they might be a chair of an ethics committees so yeah, (laughs) it's a fine balance.*

UK research governance advisors

Having a specific person go to for support and advice about integrity issues was raised in several focus groups. One of the UK mid-level researchers thought that having a *"research integrity tsar"* within institutions would be helpful. In the Norwegian mid-level researcher group, one participant thought that having a legal professional available to discuss problems, particularly regarding commissioned research with external funder organisations, would be helpful for researchers navigating dilemmas:

> *I think what is most important is to have a small, competent group. I have a skilled legal professional that I get to discuss these things with when I get into situations. That is what is the most helpful to me. To have somebody with competence on the field and that can consider different sides of a project.*

Norwegian mid-level researcher

Furthermore, in the Estonian mid-level researcher focus group, one participant thought that the creation of an official institutional level *"ombudsman"* to help with arbitration of conflicts between researchers or researchers and collaborators could be a useful addition to support research work (highlighting the social aspects of research integrity):

> *But in such case, there should be a meeting place, when there is a conflict, be it between supervisor and supervisee, some kind of suspicion of some sort of misconduct, certain committee should exist that regulates it, that people come together and discuss it, what is the problem. This is something that I have missed… That is what is needed in my opinion. People [with the task of] conflict resolution. That it would be resolved by negotiations, not through public smear campaign. This is something that is missing at the university. I know [university chaplain] is now this conflict resolver.*

Estonian mid-level researcher

Whistleblowing was not something that was discussed a great deal, however, in the Italian senior researcher focus group, it was reported that two participants stated that it was essential to protect whistleblowers, reporting cases of research misconduct. Thus, suggesting another way that institutions can support research staff to promote integrity.

Funding for initiatives to promote research integrity was spoken about in the UK mid-level researcher and research governance advisor focus groups. Whilst participants thought that institutions supported the idea of promoting research integrity, there was some concerns that resources designated to this were limited. Participants in the UK mid-level researcher group voiced some scepticism about the levels of funds that institutions might be willing to invest:

> *-I think there is a question about we should ask the university or the school how much money are they willing to put aside for this because I think the most likely outcome is-*
>
> *-£7.50 (laughs).*
>
> *-Exactly…*

UK mid-level researchers

They thought that this could potentially result in cheaper but less effective actions to promote research integrity being adopted by institutions:

> *…before our review that we have to tick boxes because that's the cheapest and, no the safest, let's put it that way, for the university to do…*

UK mid-level researcher

UK research governance advisors thought that it would be helpful if there were follow-up checks on research post ethical review to explore how the research was conducted in practice and highlight any issues regarding research integrity. It was thought that this audit of research could potentially improve integrity, by encouraging adherence to policy and procedures amongst researchers. However, lack of resources was highlighted as a reason why checks were rarely conducted:

> *-I'm curious to know, obviously you do a huge amount of rigorous exploring what a proposal is going to look like and then what the study should start off with the ethical review, is there a review at the end of a project to say did they find- No, nothing. So, because that's just in an ideal world to enforce integrity you would but there's just absolutely never going to be time to do that is there?*
>
> *-No, resources.*
>
> *-Resources again. But that would finish everything else and it would encourage people- it's another stick actually, not a carrot, but to make sure they adhere all the way through a project but that's never done. Once it's gone through its governance checks and whatever- They're off on their merry way!*

UK research governance advisors

Regarding research integrity issues that relate to research ethics, the Italian research managers focus group participants identified that there was a research ethics committee for research involving human subjects at their institution but explained that this was not mandatory. One participant thought that *"to extend the practice of the ethics committee to all disciplines"* could help *"to face these issues"* (Italian research manager). Nevertheless, other participants in this group were reported as voicing concerns about the remit of the ethics committee. They thought that research ethics committees should focus on training researchers rather than used as an instrument of control. It was feared that otherwise, research ethics committees could impede the freedom of research.

Finally, the UK senior researchers and research governance advisors spoke about the importance of focussing on research integrity as a positive thing: in terms of promoting good practice, and doing better research, rather than upon negative aspects like misconduct. It was thought that positive messages about integrity would be better received than negative ones:

> *-I think maybe just what I've got from the whole is just trying to really put research integrity in a positive light-*
>
> *(general agreement)*
>
> *-and benefit of it, not it being you've just go to do this, just really promote it this is why we do it, these are the benefits just so it can help and it being more of a positive thing rather than being another policy that you've got to adhere to and it being all something else, you know, just putting it as a positive message rather than-*
>
> *-I completely agree, and it does frustrate me when I go to some conferences and their focus is on preventing misconduct and I think that's the wrong focus. The focus should be on promoting good conduct, it shouldn't be don't fabricate, don't falsify 'cos very few researchers, well we believe, do that so I just wish it was a bit more positive… It should be about why should you conduct research to the highest standard, why is it of benefit to you and society and the institution so I agree, positive messages I think is the way it has to go. People just don't like negative messages to be honest.*
>
> *UK research governance advisors*

Moreover, UK research governance advisors thought that a positive approach which accepted that mistakes in research can happen, is more likely to encourage researchers to come forward for advice and be open and honest if they do make mistakes. Thus, mistakes were viewed as something to learn from and an opportunity to identify and solve research integrity problems:

> *…if there's a more positive spin on it, say if you make a mistake that's ok, you know, not if you make a mistake well that's misconduct and you can get in big trouble, everyone makes mistakes and again trying to be more positive about it in more of an open I suppose discussion about it that yeah, we all make mistakes, that's ok, it's how you then deal with it…*
>
> *UK research governance advisor*

8.3 Participants' suggestions for improving researcher working environment

Participants in some of the Estonian, Norwegian, Italian and UK focus groups identified improving researcher's work environment as important in promoting research integrity. Indeed, in the Norwegian junior researcher group, one participant stated that improving job stability by employing researchers on permanent rather than fixed-term or temporary contracts, was one of the most important issues discussed:

> *Permanent contracts. I mean it, clean up employment relationships*
>
> *Norwegian junior researcher*

The issue of employment security and pressures of limited funding periods for researchers was also raised by Estonian research administrators and junior researchers, and UK junior researchers. Interestingly, both Estonian research administrators and junior researchers spoke about the need to strike a balance between security and competition in the workplace. It was feared that too much security can lead to stagnation, but that extreme competition (as in America) was neither conducive to doing good quality research or researcher's good health because of the pressures:

> *Well, perhaps what matters the most to me, is one general thing, it is difficult to summarize it with one keyword, let's say it is a kind of balance between security of work and competition. If it goes too far to one extreme… if you have only tenure-based positions where you can just hang about and you end up crazy, or then places where you have to think each moment, where do I get the next grant from, what are the most popular topics, where I get the money for the next two years, you do not do the best science there either. There is, like a sweet spot, somewhere between. But well, I do not know, it is difficult for me to say… we definitely have moved towards more competition, not only in Estonia, in general, in the scientific field where I am from. But whether it has gone too far or not, it is as hard to say. Maybe not in Europe. In America, you see the cases where you have the university lecturers who are engaged in prostitution and sleep in the car, simply because they are not paid enough. Well, here we are luckily not that far.*
>
> *Estonian junior researcher*

Dealing with pressures of the academic workplace was identified as an important aspect of helping to promote research integrity by participants in several focus groups. One Norwegian junior researcher explained that dealing with pressures is important because it was thought that this can lead to 'corner-cutting' in research (this view was also echoed in the UK senior researcher focus group):

> *The cases that you see in the media are about some crazy cheaters who even swindled themselves into marriages and other things […] However, it is much more common to cheat a little bit here and a little bit there because you are pressed on time and have to finish something or other. The funding runs out, your supervisor is pushing you, or. One takes shortcuts in such situations*
>
> *Norwegian junior researcher*

It was reported that the Italian junior researchers thought that researchers needed more time to do their work and fewer pressures to publish, however no strategies were proposed regarding how to do this. Estonian research administrators thought that the regulation of teaching workloads or administration could be one way to ensure that academics have more time to conduct their research:

> *- Perhaps also regulating the teaching load for scientists… if somebody is very successful at getting projects and in scientific work, he can regulate his teaching load more freely…*
>
> *- … Perhaps we can distribute somehow that we do not supress the curiosity or creativity, we do not suffocate it with all applications and procurements or other things...*
>
> *Estonian research administrator*

Estonian senior researchers thought that institutions could be more flexible and willing to provide individual academics with free-time to focus on their work when required, and that researchers should not be penalised for requesting this:

> *- I think at the university the option for free semester is insufficiently prioritised, this should be obligatory… I would send people after few years obligatorily for half a year, better, for a year.*
>
> *- It is not as used as it could be, I also thing. And then you have to franticly explain why you want the free semester.*
>
> *- Others have to do something to make up for it, that is the problem.*
>
> *- should such things be more regulated? (interviewer)*
>
> *- Not regulated, I think, but to be more aware of. I think not all people need it, but it is an opportunity. And you will not have a stigma if you go to your boss, that this would be something outrageous to ask.*
>
> *Estonian senior researchers*

Another action to improve researchers' work environment described by an Estonian research administrator is that some institutions provide bridge-financing to project-based researchers who have a funding gap. It was thought that this is good practice and better than placing pressure on researchers to find more funding at the end of their contract:

> *One good practice that is practiced by some institutes, is that if you are a scientist on project-based funding and you have a funding gap, then your institute bridge-finances you, which is in every way a good and nice habit… we know a number of institutes that will put the contract on the table three months before the end of the grant and [given] the notice of end of contract, and others who say, "Easy, you can go on for a year, just find money"…*
>
> *Estonian research administrator*

Also related to funding, one of the UK junior researchers highlighted that it was important for funding to cover all aspects of research work to ensure that researchers are paid fairly for their work. This individual described that sometimes time required to complete certain aspects of research work is not properly accounted for leaving researchers to complete the work in their own time and effectively unpaid:

> *…the other thing is so doing the whole open science thing… so open data is easy enough is you're just running experiments but if you work with imaging data the organising of those datasets and then creating the metadata that is such an involved project, there's a massive overhead on that that it's not part of the research output, it's not being funded, it's really hard to- I think again if that's- if you're working in a group where that is an accepted practice that's a lot easier than if you're having to spend your evenings doing that just because your funder requires it, if that makes sense.*
>
> *- So like time being an issue? (interviewer)*
>
> *- Yes.*
>
> *UK junior researcher*

Finally, one Estonian research administrator commented upon the need to provide researcher space to conduct their work, but to also support and protect them in the work environment. This somewhat corresponds with suggestions for increased support for researchers (see above):

> *The greatest contribution that I [as an administrator] can give is that I do not disturb them [researchers]… Do not deter them. And perhaps protect them like an umbrella from the blows from without, jump in line of fire.*
>
> *Estonian research administrator*

8.4 Participants' suggestions for training

Training to promote research integrity was raised in every focus group conducted in Norway, Italy and the UK, but interestingly, none of the Estonian focus groups were reported as discussing the need for training when asked about needs or promoting integrity. There were a number of suggestions made by participants regarding training. In the Italian research manager group, one of the participants thought that if students and researchers are expected to operate according to certain codes of ethics, then it is important that they receive adequate training that introduces these codes to them:

> *In order to train for research, it is important that in the degree and in the PhDs programs opportunities for study, presentation and discussion of these tools of these materials are given. If we have to educate researchers, then it is important that these codes [of ethics] are presented to them.*
>
> *Italian research manager*

In discussions about training there were a variety of views regarding who should be provided with training about research integrity and at what level, suggesting that it would be beneficial to ensure that training is provided to different staff involved in research and at all levels. Training was viewed as particularly important for students and one Italian mid-level researcher thought that a lack of training about research integrity issues contributed to poor behaviours in students:

> *Students do not have ethics, they plagiarize, they pretend to have done interviews they do not have done.*
>
> *Italian mid-level researcher*

However, a UK senior researcher thought that training could only go so far in preventing cases of misconduct or lapses in research integrity:

> *…That doesn't mean to say just training someone to do high quality research will necessarily mean that they will behave with integrity. It might be a bit more likely but, you know…*
>
> *UK senior researcher*

A participant in the Norwegian research administrators group thought that it is important for their institution to provide training about research integrity for researchers who do not have a PhD because they do not have formal research training, yet are working research roles, facing ethical dilemmas:

> *They do not have a PhD, they do not have any formal teaching as a researcher. That means that they have the same education as I do, and they are left alone to figure out a broad spectrum of research ethical considerations by themselves.*
>
> *Norwegian research administrator*

Italian junior and senior researchers were reported as stating that training should be made available to both students and research staff. Furthermore, Italian senior researchers were reported to highlight how integrity more generally should be something that is taught to children from an early age. Indeed, the view that integrity should be instilled at an early age was echoed in the Norwegian mid-level researcher focus group:

> *Is it not a little late on the PhD-level? It should come a little earlier. Going all the way back, I have a kid in elementary school, I feel like already there they are very caught up in that they should show all their sources. Nobody ever told us, when I went to school. I might be a start. If they follow it…*
>
> *Norwegian mid-level researcher*

Interestingly, whilst the UK junior researchers thought that it was important to introduce training about research integrity early on, some participants also reflected that this training must be relevant to individuals to be of use. Describing their own experiences at undergraduate student level, they suggested that it can be difficult to find relevance in research integrity training when you are not doing research in earnest:

- I guess it seems important to instil it at an early level but then I also said that when I got told about it at an earlier level I really didn't take anything in so I'm not really sure how you should but that seems sensible.

-… it's pointless telling someone who's an undergraduate about it [research integrity] because they're thinking well I'm just here 'cos that's what all my mates are doing, you know, I've no intention of being in research so why does research integrity matter. Just in terms of timing it seems kind of appropriate.

UK junior researchers

Indeed, UK senior researchers also thought that training should perhaps be provided at a stage (junior level research staff) in a researcher's career where research integrity issues are most relevant and helpful:

…I would, in terms of having some courses, but that would probably target senior post-docs and junior academic staff because, you know, they're at the beginning, they have this idea ok why this is important…

UK senior researcher

However, one of the UK junior researchers thought that more recently, the notion of research integrity has developed into a *"thing"*. Consequently, research integrity may now be more salient to students earlier on:

It seems like in the last few years there's actually been a change to talk about in terms of research integrity whereas it was never a thing before, there was just stuff you should do, all of which is now under this umbrella so hopefully for the next generation it should be a thing.

UK junior researcher

Individuals from the UK mid-level and senior researcher focus groups thought that it was also important to provide training to more senior researchers about research integrity. The mid-level researcher's rationale for this was because senior researchers are the people who are influential and make decisions:

I would suggest focusing on actually teaching the older generation… because they are more powerful. They decide which paper goes where. They are the editors; they are the people that decide… I think we need to educate- someone needs to… actually realise that the problem lies at different levels and it's up there so even at that level, high level…

UK mid-level researcher

A UK senior researcher thought that more senior level researchers could benefit from training because it will help to raise awareness about research integrity issues in this demographic:

…I think it's probably a good idea not just for the students to have it placed in front of the centre of training but also perhaps for us [senior researchers] to think-

possibly think about it a little bit more than we might otherwise do or at least some of us.

UK senior researcher

Furthermore, one of the UK mid-level researchers thought that it was particularly important for institutions to provide training to staff in supervisory roles, who are responsible for training students who will be the next generation of researchers:

I think that we have to instruct the young generation scientists… just like when a young lecturer comes, the university needs to take charge of actually telling a certain way of teaching them how to teach, why they don't teach them how to actually engage with their own PhD students or Masters students, I mean, not the undergraduates but, because that could be the next generation of scientists.

UK mid-level researcher

Finally, a Norwegian senior researcher implied that training about research in general may also be helpful for wider members of staff involved in research, such as administrators, to facilitate better research conditions:

If those who are associated with the project in an administrative, supporting or controlling function do not understand what research is, then our conditions for doing research become very bad.

Norwegian senior researcher

In addition to thinking about who should receive training, there was some discussion about the content of training. Some individuals pondered whether training about research integrity should be compulsory (as in the comment above (section 8.2) about clear guidelines made by a Norwegian research administrator). Some participants from the UK junior researcher group thought that training should be quick and easy to do (also see practical tools below, section 8.5), but, they also assumed that training could be a way to promote discussion amongst students and researchers about integrity issues:

I guess in that way there's- the governance and stuff has to be as short and to the point as possible, that- yeah. It can be like spoon-fed to you literally like a compulsory 15-minute online tutorial and you still get the general gist of it and then everyone can grumble about it over coffee like oh I have to do this stupid online tick box exercise but at least people then can talk about it and it's a bit, you know, people are aware of it.

UK junior researcher

With regards to specific topics, one participant in the Norwegian junior researcher focus group thought that institutions should ensure that students are provided with adequate training in citation practices to help prevent plagiarism:

> *Citation practices, I think that was maybe the weak link in the lectures at my study program. And I have also taught students about it myself and seen how incredibly hard it is to make them understand what it is really about. Yes. One forgets it quite often. We have had some pretty large cases of plagiarism lately.*
>
> *Norwegian junior researcher*

There were some concerns amongst UK mid-level and senior researchers that training should not just become a 'tick-box exercise'. One individual stated that they did not like the types of staff training tutorials that some of the UK junior researchers referred to as useful, instead they thought that individuals being trained need to be able to engage more fully with training materials, otherwise it will not be as effective:

> *I think the thing I like the least is to have a little video tutorial that everybody has to watch as part of their staff review and development setting, where we then tick the box saying yes, we've engaged with the material and move on. I think that's a real danger if the funders feel well we've put everything in place, why is no-one using it?*
>
> *UK mid-level researcher*

One of the UK senior researchers suggested that training about research integrity should be designed to be intellectually stimulating for researchers so that they will be more interested and willing to properly engage with the topic:

> *I think the way that you reach academics is to discuss with them something that is intellectually interesting and- we've been talking the whole afternoon about this stuff because its intellectually interesting, how do you regulate this or how do you define it, that's- and that's how you get academics interested but if you start presenting it as well here's yet another box ticking exercise and you need to jump through these hoops…*
>
> *UK senior researcher*

Participants from the UK mid-level and senior researchers as well as research governance advisor focus groups all spoke about case-based training or training based on 'real life' examples as something that they thought would be particularly effective for teaching individuals about research integrity. One of the UK mid-level researchers thought that general workshops and video training that does not draw upon examples, could be ineffective because integrity dilemmas are highly contextualised:

> *…why is the workshop or video insufficient? Because everything is so contextual, and you try to define it and then immediately that something happens off the list, so you have to engage with examples…*
>
> *UK mid-level researcher*

Indeed, UK research governance advisors with experience of providing training to researchers about research ethics and integrity spoke about how they often found face-to-face and discursive style training based on cases or examples an effective way to get individuals to engage with the topic:

> *I think when we've had experiences when we get a lot of staff together to talk it through discursive events, they seem to sort of organically create the potential issues and people can explore them in a safe place and they seem to sink in a bit better so I think rather than a formal online training something a little bit more interactive tends to work nicely and people respond better to materials that they have to know about if its delivered in person I think.*
>
> *UK research governance advisor*

One research governance advisor thought that online tools perhaps do not provide the support and reassurance compared to face-to-face sessions where researchers participate in group discussions with staff from different seniorities:

> *…just having someone sit in front of a computer, ok just do this online learning because it doesn't- it can either be a negative thing to do because you come away thinking ok, so I'm not doing any of that or I've got no-one to talk about this so you just- You're just sat in your own office in front of a screen, probably panicking thinking oooh, but when you're in a group you can discuss it and it becomes less of a barrier, more of a ok, so these are the things that I need to take on board and these are things that I need to adhere to.*
>
> *UK research governance advisor*

Certainly, as supervisors to students, the UK mid-level researchers discussed how important it was to make use of dilemmas that may occur in research work, to help engage and educate students about research integrity. One participant thought that supervisors should refrain from providing answers or imposing solutions upon students to encourage them to think for themselves what ought to be done:

> *I can discuss about something that happens, you know, research integrity with students and I'm not going to say oh this is the way you should do it, we discuss about what has happened, what I've heard has happened, and I ask them: 'what do you think you would have done?' But this is- I'm not giving a final what I would have done, I'm not trying to impose anything because that misses the point because you're not going to teach anything if you do that. So, you just, you know, trying to engage with them and then maybe for some cases it might be a student comes back and say "oh I've thought about this and what are we going to do"…*
>
> *UK mid-level researcher*

UK senior researchers also perceived that there was great value in learning through discussion of 'real life' examples. One participant thought that borderline cases as well as clear examples of

misconduct or lapses in integrity could be valuable to discuss because people may have different views that can be discussed:

> *…so when you ask about what should university do in terms of education, I think I would put it in the form of case studies I think, you know, what can go wrong and what can you do about it, do you think this is wrong, get people to talk about real cases of obvious research failure of integrity but also maybe some borderline cases where people might disagree… having those kind of discussions would be very useful.*
>
> *UK senior researcher*

Another form of case/example-based training described by some of the UK research governance advisors were "*lessons learnt sessions*". Here, senior researchers share past mistakes with other researchers in their institution. This approach to training was viewed as successful because it engages researchers and can help to reassure junior researchers that research work is manageable and that mistakes can happen, but that these can also dealt with:

> *- We've had some sessions where we call them lessons learnt and it's whether the staff, you know, a more senior staff member and a way of encouraging senior staff members to actually be engaged is if we ask them to present and actually- and if they present on their experience its more easily absorbed by the individuals who attend.*
>
> *- And I think that approach also can address sometimes when, especially the younger researchers feel quite overpowered and daunted by the number of policies that they're coming face to face session with experienced researchers I think that can sort of disperse some of that, you know, say we've been there, we've done that, its manageable, you can do it…*
>
> *UK research governance advisors*

Nevertheless, as discussed above (see section 8.2) this level of openness, to share mistakes, was not thought to be something that all researchers would feel comfortable in doing. Finally, one of the UK research governance advisors spoke about a pre-existing educational tool for case-based learning about research integrity: The Dilemma Game, devised by Erasmus University, Rotterdam. This participant stated that they had utilised this successfully and found that individuals engaged well in this training:

> *One resource that I like, and I find people really engage with this, it's really helpful as well, I don't know if you've come across it, it's something called the dilemma game by Erasmus University possibly in Rotterdam or Amsterdam where they've got like case scenarios of research integrity that have gone wrong. When we've taken that with sessions of researchers it has really helped just open up discussion and so I think just more case studies based sessions is probably the way to go…*
>
> *UK research governance advisor*

With regards to implementing training one of the UK mid-level researchers thought that it was important for researchers in supervisory roles to take responsibility to educate their students:

> *I'm just thinking more about the personal individual level, so we should take the responsibility as we engage our PhD students and Masters students- At least, certainly PhD student… to actually teach them, make them aware…*
>
> *UK mid-level researcher*

However, members of the UK research governance advisors group highlighted that it can be often very difficult to gain attendance of senior researchers at training sessions about integrity issues because of their busy workload and time pressures, but also because some think that they *"already know"* the information:

> *The problem we have is its very junior individuals who attend those sessions and we do have difficulty engaging with the more senior level researchers because of time and because they think they already know it…*
>
> *UK research governance advisor*

Whilst case/example-based and face-to-face training were well regarded by participants discussing these styles, one of the UK research governance advisors also highlighted that a limitation of this type of learning is that they require a lot of resources (something that was identified as being in limited supply, see section 8.2 above). Furthermore, they also highlighted that these sessions had potential for inconsistencies in terms of what is discussed:

> *Unfortunately, that's [face-to-face sessions] resource intensive and you've got no absolute guarantee that certain information is being delivered by one single individual to another, but the personal touch does help I think.*
>
> *UK research governance advisor*

A UK research governance advisor highlighted another limitation of face-to-face sessions at their institution is that it can be difficult to get academics together to do training because of their workloads. Thus, demonstrating the value of online training resources that people can work through individually, in their own time:

> *I think especially in our institution its time isn't it, like you said, trying to get people together and when you've got an online resource that someone can just sit and do on their own, measure that against trying to get x number of academics in a room together for half a day, that's always going to win but it's never the better option at all*
>
> *UK research governance advisor*

Another training implementation issue raised by one of the UK research governance advisors was the importance of collaboration between professional services staff (research governance advisors/administrators) and researchers to deliver training. It was thought that researchers engage with and benefit more from discussions with their peers compared to training delivered by professional services staff. This relates to the idea of *'research integrity champions'* (see section 8.2 above), where it is believed that researchers are better equipped to deliver messages about research

integrity because they can speak to others with knowledge and experience, in the language of research:

> *The difficulty is you need research groups and supervisors to take it on so you really need a supervisor in a group to say right, let's just- we're having a team meeting, let's just talk about a particular dilemma to get us talking about research integrity and you just pick one of a hundred, perhaps one that's impacted on them before but you do need them to engage with it 'cos whilst we as professional services can put one up on a screen and say discuss or you can go around a room, ultimately it's with their peers and their supervisors that I think they'll get more benefit from that session rather than a professional services person… We can't deliver the message in the same way as academics or supervisors can...*
>
> *UK research governance advisor*

Finally, as mentioned above (see section 8.2), it was reported that some of the Italian research managers thought that the institutional Research Ethics Committee should be committed to providing training to researchers.

8.5 Participants' suggestions for practical tools

There was some reference to the development and use of practical tools that could help researchers and promote research integrity, in the Norwegian mid-level researcher, Italian research manager and UK junior, mid-level and senior researcher focus groups. In the Norwegian mid-level and UK junior researcher focus groups, participants spoke about tools in terms of computer-based training for researchers about research integrity. Here, a Norwegian mid-level researcher thought that an *"obligatory web course"* could be helpful to promote discussions about integrity, and junior researchers in the UK described how they found computer-based training tools already offered to them by their institution (regarding data management and confidentiality) helpful because they are relatively quick and simple to use, enabling researchers to work through them in their own time:

> *- …they do have some educational tools about, you know, confidentiality and data or how to deal with discrimination in the workplace and I personally found those educational tools good and easy to use and it doesn't take up like a huge amount of time, it's mainly like 45 minutes to an hour and I think those are really well thought out and useful.*
>
> *- So like sort of online stuff that people can work through in their own time? (interviewer)*
>
> *- Yeah, exactly.*
>
> *UK junior researcher*

Moreover, in thinking about educational tools such as on-line training, a UK mid-level researcher highlighted that these tools should be developed to accommodate for the training needs of researchers at different levels of seniority. This follows on from discussions about training above, where participants suggested a range of roles (i.e. students, researchers and research support staff) as well as levels of seniority where training might be required:

> *…if it's actually the really senior people that need the most out of the education (laughs) then that needs to be inherent in the design of the tool as well. There's no point educating the next generation when actually that's not where the problems arise, or that's the easiest one to correct as well.*
>
> *UK mid-level researcher*

When asked what researchers need to help promote research integrity, one aspect that UK senior researchers thought about was tools that can help them to do good research. They described how the provision of practical tools to facilitate collaboration between researchers, such as software to assist in document sharing, archiving and project management is particularly helpful for them in their work. One researcher described how recent software developments can facilitate this by bringing different elements together:

> *…Microsoft has done some good stuff recently and so what- Microsoft offers one thing which is called SharePoint which is kind of- 'cos what currently happens yes you have stuff in email, you have Dropbox, you have Sharelatec documents, you will have a Google Drive and nothing ties these things together and SharePoint is somewhere we can tie a lot of these things- so you can have a to do list, you can have a calendar, you can have a repository for documents and so on…*
>
> *UK senior researcher*

A suggestion made by an individual in the Italian research managers focus group was that researchers and institutions should *"use and spread the tools that already are available"*. Here it was reported that reference was made to anti plagiarism software, with the suggestion that this should be used to check more student work, but also professors' manuscripts. Also, in the UK research governance advisor group, one participant mentioned how they use case-based training: 'The Dilemma Game' developed by Erasmus University, Rotterdam.

Finally, a member of the UK mid-level researcher focus group thought that it might be helpful for researchers if some sort of social media tool to 'ask a friend' was developed, enabling individual researchers to communicate with each other, offer advice and support about research integrity issues and dilemmas:

> *Almost like the social media hashtag of asking for a friend, you almost want to be able to post and say (laughs) I've heard about this and start an appropriate hashtag asking for a friend because it is that sort of setting where people can actually sometimes test out situations as well.*
>
> *UK mid-level researcher*

Summary

There were many suggestions made by participants of ways to promote research integrity and identify what researchers need.

There was a recognition that systemic changes were required, particularly evaluation and incentive structures to make them more compatible with promoting research integrity.

Of particular importance was the issue of creating a positive research culture for integrity, to build resilience to external pressures and improve self-regulation. Participants identified many ways in which they thought research cultures could be improved to meet the needs of researchers and promote integrity, including raising awareness, provision of training, support and arbitration services, and importantly clarity regarding rules, procedures and sanctions.

It was also recognised by participants from across all four countries that to promote research integrity, institutions need to improve working conditions of researchers. Introducing more stability in work contracts, providing protection and support, and managing workloads and ensuring that researchers have adequate time to do research were all identified as important.

Training was identified as an important issue, it was thought that this should be provided to research staff at all levels and be relevant and interesting to researchers. There was recognition that some training should take the format of quick and focussed individual training, but some caution about adopting a 'tick-box' approach. Many participants suggested that group level, discursive or case-based training would also be highly beneficial to researchers.

The development of or access to practical tools to help researchers in their everyday work such as project management and software to facilitate collaboration, as well as social media tools to aid communication about research integrity dilemmas were thought by some participants to be helpful.

Conclusions

The focus groups captured views from individuals involved in research in different capacities, across different settings, and with a range of individual characteristics. There was variety in job type, level of seniority, academic discipline, gender and nationality. With one exception (a difference between the UK and Italy in terms of participants' knowledge of the existence of research integrity policies), there was little variety across countries. Instead, it was notable that many themes emerged that were common across the focus groups.

Participants' work in research was motivated by curiosity, enjoyment, and a drive to improve the world. Participants believed that for research to be good, it should be methodologically sound, make a contribution to knowledge, and be conducted in a positive setting. When it came to bad research, poor practices and misconduct, participants were able to name several practices that were considered wrong or dubious. They regarded some actions to be worse than others, and there was a belief that the intentions of the researcher were important.

Despite being able to identify a lack of research integrity, and being able to characterise good research, participants had less clarity about what research integrity meant. They associated research integrity with methodological soundness, an adherence to social responsibilities, and being a good person.

Participants were readily able to identify several challenges to research integrity, including systemic problems, pressures of the academic work environment, problems with research culture, conflicts of interest and accessibility and translation of policies into practice. These problems were elaborated on in detail. There was less awareness of formal policies and procedures for promoting research integrity, particularly in Italy. Participants explained that their training on research integrity could be implicit or explicit, and described some problems in research integrity education. Finally, participants had many ideas about how research integrity could be promoted, including systemic changes,

building a positive research culture, improving researcher working conditions, and through training and practical tools.

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Appendix 1
Question Route: Researchers

Warm up:

Please tell us your name and what you most like to do when you are not working on research

Intro/general question:

Can anyone tell me why do you do research, what are your motivations?

- What makes good research?

Transition Q:

Could anyone tell me what sort of things you consider as bad research? For example, what sort of things do you consider misconduct or poor practices in research?

Prompt: Fabrication/ Falsification/ Plagiarism/ sloppy research?

Prompt: Are there any grey areas?

Key Q's:

a. Defining research integrity & what it means in practice for researchers

- **How would you define research integrity?**

(Can use a flip chart to write answers & promote discussion)

Follow up:

Is research integrity something that you reflect about or discuss often with colleagues?

b. Research culture: expectations & management of research integrity

- Could anyone tell me what barriers or challenges you think researchers face in their everyday work that can affect research integrity or misconduct?

Prompt: modern research practices such as new methods/ increased collaboration - international, public/private or interdisciplinary

Follow up:

Can you describe situations where you may face competing expectations?

Prompt: e.g. conflict of role/interests - how do you negotiate these?

c. knowledge & education & impact of policies about research integrity on practice

- Thinking about policies your institution adopts that relate to research integrity and misconduct or wider policies such as [Singapore statement/UK Concordat or other national polices] that have been developed, can anyone tell me how these impact your research?

Prompts:

How have you become aware of the policies? Do you think these policies widely known?

Are they effective/ helpful? Do they pose any benefits or barriers?

Are there any sanctions? If so what are they? Do they work?

10-15 minute break

d. Support, interpretation & translation of research integrity policies

- Can someone tell me how you have learnt about standards of good research conduct and integrity?

Prompts:

How do researchers learn good research practices? Mentors/guidance/tools?

Follow up:

- Can anyone tell me who you would discuss problems with if you felt uncertain or worried about research integrity or misconduct?

e. What works & what needs improvement

- Could anyone tell me what you think researchers need to foster and maintain research integrity?

Prompts:

what works well? at your institution? / nationally or internationally?

Education/support/tools?

- Can anyone tell me what you think are the key barriers for the development of research integrity?

Prompt: in your academic field/school/university?

Ending Qs:

a. All things considered Q:

Could anyone tell me…

Of the issues that we have discussed about research integrity and misconduct today, what do you think is the most important issue that should be focussed on to ensure that research integrity is encouraged in everyday research work?

b. Missing anything Q

The aims of the PRINTEGER project are to promote research integrity as part of conducting excellent research through emphasising research practices and not just focussing on top-down application of rules and regulations. Therefore, we are informing the project by talking to you, individuals who are involved in research on the work floor. We want to learn about your experiences and every day dealings with research integrity and misconduct issues. Have we have missed anything? Is there anything that we should have talked about but didn't?

Close session

Appendix 2

Question Route: Research Governance Advisors

Warm up:

Please tell us your name and what you most like to do when you are not working at the University

Intro/general question:

In your work you all help to support or manage academic research. Can anyone tell me what this work involves?

Transition Q:

- Could anyone tell me what sort of things you consider as misconduct or poor practices in research?

Prompt: Fabrication/ Falsification/ Plagiarism/ sloppy research?

Prompt: Are there any grey areas?

Key Q's:

f. Defining research integrity & what it means in practice for research governance advisors/managers

- **How would you define research integrity?**

(Can use a flip chart to write answers & promote discussion)

Follow up:

Why is research integrity important from support or managerial perspectives?

g. Research culture: expectations & management of research integrity

- Could anyone tell me what barriers or challenges you think researchers face in their everyday work that can affect research integrity or misconduct?

Prompt: modern research practices such as new methods/ increased collaboration - international, public/private or interdisciplinary

Follow up:

Do you encounter situations where researchers discuss competing interests with you?

Prompt: e.g. conflict of role/interests - how are these negotiated?

h. Research integrity policies

- Thinking about policies your institution adopts that relate to research integrity, can anyone tell me what sorts of things are included and why are they important?

Prompts:

What is prioritised at your institution and why?

What are the main risks faced by your institution in relation to research integrity?

Are there any sanctions? If so, what are they?

10-15 minute break

i. Support, interpretation & translation of research integrity policies

- Could anyone tell me whether you think that the policies developed to address research integrity and misconduct are effective in everyday practice?

Prompts:

In what ways are they effective or not?

If you have sanctions, do you think they work?

j. What works & what needs improvement

- Could anyone tell me what you think currently works well in fostering and maintaining research integrity at your institution?

Prompt:

Does anyone have any good or bad examples of activities intended to promote and develop research integrity?

- Does anyone have any ideas in ways that your research institution/organisation can further develop its integrity policies and reduce misconduct?

Ending Qs:

c. All things considered Q:

Could anyone tell me…

Of the issues that we have discussed about research integrity and misconduct today, what do you think is the most important issue that should be focussed on to ensure that research integrity is encouraged in everyday research work?

d. Missing anything Q

The aims of the PRINTEGER project are to promote research integrity as part of conducting excellent research through emphasising research practices and not just focussing on top-down application of rules and regulations. Therefore, we are informing the project by talking to you, individuals who are involved in research on the work floor. We want to learn about your experiences and every day dealings with research integrity and misconduct issues. Have we have missed anything? Is there anything that we should have talked about but didn't?

Close session

Appendix 3

Overview of participants for each focus group

Country	Participant group	Number in group	Gender distribution	Disciplinary backgrounds/experiences
Estonia	Junior researchers	7	5 Male 2 Female	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences Medical and life sciences Language, Information and Communication
Estonia	Mid-level researchers	6	4 Male 2 Female	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences
Estonia	Senior researchers	5	2 Male 3 Female	Natural sciences Medical and life sciences Language, Information and Communication
Estonia	Research administrators	8	5 Male 3 Female	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences Medical and life sciences Language, Information and Communication
Norway	Junior researchers	3	3 Female	Social and behaviour sciences Law, Arts and Humanities

Norway	Mid-level researchers	4	1 Male 3 Female	Social and behaviour sciences
Norway	Senior researchers	5	1 Male 4 Female	Social and behaviour sciences Medical and life sciences
Norway	Research administrators	4	2 Male 2 Female	Not reported
Italy	Junior researchers	7	5 Male 2 Female	Law, Arts and Humanities Engineering Sciences Natural sciences Language, Information and Communication
Italy	Mid-level researchers	7	Not reported	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences
Italy	Senior researchers	5	2 Male 3 Female	Law, Arts and Humanities Natural sciences Medical and life sciences
Italy	Research managers	11	Not reported	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences Medical and life sciences
UK	Junior researchers	5	4 Male 1 Female	Law, Arts and Humanities Natural sciences Medical and life sciences

UK	Mid-level researchers	3	2 Male 1 Female	Natural sciences Medical and life sciences
UK	Senior researchers	3	3 Male	Law, Arts and Humanities Engineering Sciences Natural sciences
UK	Research governance advisors	4	1 Male 3 Female	Social and behaviour sciences Law, Arts and Humanities Engineering Sciences Natural sciences Medical and life sciences Language, Information and Communication

Appendix 4

Tables of second and third order constructs

The following tables detail the synthesis. They are organised in terms of second and third order constructs. The second order constructs are derived from stage five of the synthesis process.

The third order constructs are derived from the second order constructs as per stage six (synthesising translations) see methods section of main report.

In the third order construct tables, column: Focus groups – the following abbreviations are used:

E = Estonia, N = Norway, I = Italy and U = UK,

JR = Junior Researcher, MR = Mid-level Researcher, SR = Senior Researcher and RO = Research Others: administrators/managers/governance advisors

Motivations for doing research (questions posed to researchers only)

Second order constructs - motivations:

Country	Junior Researchers	Mid-level Researchers	Senior Researchers
Estonia	1. Innate curiosity 2. Contextual circumstances that either invited or pushed to continue with PhD studies	1. Innate curiosity	1. Innate curiosity 2. Family tradition 3. Impulse from bachelor studies coupled with favourable conditions
Norway	Not reported	Not reported	Not reported
Italy	1.Enjoy the work 2. A calling 3. Curiosity 4. Fun	Not reported	Not reported
UK	1. Curiosity - theoretical research 2. Applied research - making things better 3. Enjoyment - liked the work & fun 4. Research as a career - following a career path	1. Curiosity - theoretical research 2. Making things better - applied research 3. Enjoyment	1. Making things better - applied research 2. Curiosity - theoretical research

Third order constructs - motivations:

Translation of studies: 3rd order constructs	Description	Focus groups
Curiosity	Curiosity and intellectual interest in a particular topic/ discipline or in doing academic research. A drive to understand things	EJR, EMR, ESR IJR UJR, UMR, USR
Enjoyment & fun	Enjoyment or pleasure in doing research/academic work	EJR, IJR UJR, UMR
Improvement	Doing research that can improve things such as the world, health or developing an academic field	UJR, UMR, USR
Circumstantial routes to becoming a researcher	Various contextual circumstances that have led to individuals becoming involved in research or enabled them to continue to follow their career path	EJR, EMR, ESR IJR UJR
Unquestionable pursuit of a scientific/research career	Reasons for going into research over any other career: being part of the family tradition or a 'calling'	ESR IJR

Defining good research

Second order constructs – good research

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. Honesty & transparency: 1.1. methodological rigidity 1.2 unbiased treatment of data 1.3 Proper citing of sources 1.4 Fair assignment of authorship 1.5 Transparency 2: autonomy of science	1. Proper scientific method 1.2 Honesty and unbiasedness approach to data 1.3 Wholesomeness, good understanding (and respect for) the disciplinary context 1.4 Correctness of citing sources 1.5 Openness to surroundings	1.Related to scientific research: - Search for truth - unbiased attitude - openness & value free - correctness of presenting results 2. Relations within scientific community as a collective - treatment of people in the system	1. Replicability 2. Transparency & accessibility 3. Development & learning
Norway	uses 1st order constructs - truth seeking, and whether or not the research is useful	Not reported	Not reported	Not reported
Italy	Uses first order constructs: 1. Enhancing knowledge 2. Definition depends on discipline 3. To have time	1. Applies very strictly to standard methods shared by scientific community 2. Published in top journals	- Definitions provided in European Codes: European Charter for Researchers of 2005 and the Code for Research Integrity in its	Not reported

		3. Social relevance 4. Bringing something new	revised version of 2017. - Aim to increase knowledge (not just a career) - Having a research culture of integrity	
UK	1. Innovative 2. In search of truth - getting as close to the truth as possible (but not so for the Arts) 3. Convincing 4. Methodologically good research 5. Making things better	1. Good scientific practices - reproducibility - Progression of knowledge 2. Good research needs the right environment	1. Research that makes the world a better place 2. Use of good scientific process - rigorous methods - right questions	Not reported

3rd order constructs – good science

Translation of studies: 3rd order constructs	Description	Focus groups
Proper methods	Good research should be rigorous and adhere to the methodological standards shared by the research communities and acknowledge disciplinary differences	EJR, EMR, ESR, ERO NJR IMR, ISR UJR, UMR, USR
Furthering knowledge	Good research should be original and add something new to current knowledge	EJR, ERO IJR, IMR UJR, UMR
Improvement	Doing research that can improve things such as the world, health or developing an academic field	EJR, ERO NJR IJR, IMR, ISR UJR, USR
Positive research culture	Good research requires a positive research environment that is fair and respectful of members of the research community and enables them to flourish in their work	ESR ISR UMR

Defining bad research, poor practices and misconduct

Second order constructs – Bad research

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. Misconduct related to data and sources 2. Opportunism 3. Hype & Embellishment strategies 4. Misconduct related to publishing research 5. Issues stemming from research as a collective practice	1. Deviation from main principles of research integrity 2. misconducts related to pressures of system 3. Stemming from research as a collective practice	1. Deviations from main aim of science (search for truth & methodological rigidity) 2. Research as collective practice -fair distribution of authorship -treatment of people 3. Scientific climate - "scientific capitalism"	1. Methodologically sloppy scientific research 2. personal relationships between co-workers - treatment of subordinate colleagues in research on the border of abusive 3. Questions of Authorship & contribution 4. Possible causes of misconduct 5. Science as self-regulatory
Norway	Not reported	classical understanding, varying degrees of bad	Not reported	Not reported
Italy	- Definition & perception depends on the field - distinction between questionable research	Plagiarism & self-plagiarism False authorship Data fabrication Questionable practice - Salami slicing	- linked to aims and aspirations of researcher - career driven = more likely to misconduct (not agreed by all participants) - 3 levels of misconduct:1. misconducts	Distinction between misconduct and questionable Research practices - grey areas - Those listed in ALLEA guidelines

	practices and misconduct - Distinction between integrity of researcher & good research -To Misrepresent results - To be a bad reviewer - To read an inappropriate bibliography -Plagiarism - -to write little significant articles - personal use of collective data - Excess of trust - False authorship - self plagiarism	Double-submissions	punished by civil & penal codes (e.g. fraud or plagiarism); 2. Ones regulated by professional codes of conduct; 3. QRP - not punished Types of misconduct: Plagiarism data manipulation & falsification false authorships abuse of power publishing poor quality/low originality articles Publishing to increase citation index To hastily move from basic research to applied research	-Falsification -Improper use of Authorship - Nepotism in peer review process -Overinflating/ overstating results - Selective citation - self plagiarism - interpreting data to fit your idea - Student issues - low quality publications
UK	- Dishonesty - Exaggeration - overstating findings - Poor work: lack of competency or critical awareness -bias: cherry picking data	1. Not adhering to good scientific methods 2. Publication bias - hard to publish negative results 3. Authorship issues - fair	- Bad research distinguished from misconduct & poor practices - Bordering on misconduct - salami slicing - stems from increased competition - Arts & humanities -	1. Broad scope 2. Role of intention 3. importance of learning from incidents - institutions and individuals 4. Lone researchers most at risk

	Grey areas - finding balance between maximising data & knowing limitations of own research	distribution of credit - differences between disciplines 4. Bad peer reviews	different misconducts - Plagiarism - increasingly a problem - - plagiarised work not necessarily bad work, reliable despite misconduct - Trust important in research	

3rd order constructs – Defining bad research, poor practices & misconduct

Translation of studies: 3rd order constructs	Description	Focus groups
Identified misconduct/QRP/bad research	An outline of various things identified as misconduct, QRPs or bad practices	EJR, EMR, ESR, ERO NMR IJR, IMR, ISR, IRO UJR, UMR, USR, URO
The sliding scale	Misconduct to QRPs - grey areas: intention & disciplinary differences	EJR, EMR, ESR, ERO NMR IJR, ISR, IRO UJR, UMR, USR, URO
Perceived causes of misconduct, QRPs and bad research	Various factors that participants draw upon to explain the occurrence of misconduct or QRPs	EJR, EMR, ESR, ERO IJR, IMR, ISR, IRO UJR, UMR, USR, URO
Dealing with misconduct, QRPs and bad research	Research as self-regulating, institutional response	EJR, EMR, ESR, ERO USR, URO
Outcomes of misconduct and QRPs	Potential outcomes of misconduct and QRPs identified	EJR, EMR, ESR, ERO UMR

Defining research integrity

Second order constructs – Defining research integrity

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia[4]	1. Honesty & transparency: 1.1. methodological rigidity 1.2 unbiased treatment of data 1.3 Proper citing of sources 1.4 Fair assignment of authorship 1.5 Transparency 2: autonomy of science	1. Proper scientific method 1.2 Honesty and unbiasedness approach to data 1.3 Wholesomeness, good understanding (and respect for) the disciplinary context 1.4 Correctness of citing sources 1.5 Openness to surroundings	1.Related to scientific research: - Search for truth - unbiased attitude - openness & value free - correctness of presenting results 2. Relations within scientific community as a collective - treatment of people in the system	1. Replicability 2. Transparency & accessibility 3. Development & learning
Norway	Initially **unsure** when asked to define integrity **openness, rule-following and resisting pressure.** -taking an active role in ones working life, asking the right moral questions	Research integrity = opposite to bad research - varying degrees Openness & transparency Respect informants	- Seeking the truth: doing research in an objective way, producing new knowledge - Respect: one's **field**/ **colleagues** (importance of respectful feedback) **informants** (Stovner case (Oslo) stigmatising - include stakeholders	-Integrity can fall on different points on a scale (grey areas) - Breaches a result of different things: Cynical cheating/grey area/honest mistakes

[4] In the Estonian reports findings about good research and research integrity were presented as one and not distinguished from one another.

		(participants) - protect from unnecessary burdens/stigma	in process to prevent this) - Openness/transparency (about methods, open to scrutiny) - Usefulness/relevance (research to create solutions for societal challenges) - Absence of QRPs & fraud ('sjusk' - sloppiness, no shortcuts - particular problem with commissioned research)	-Transparency - Replication
Italy	Focus on defining what research integrity is not - High quality - Self-correcting system (science) - reproducibility Differences between disciplines	Defined as opposite to misconduct - Reliable data - no conflict of interest - Easily reproducible - correction of errors & development of research work (different for social sciences) - Importance of sharing data for reproducibility (different for non-scientific disciplines)	1. Good scientific methods - Science as self-regulating- correction of mistakes of individual researchers as a collective 2. Relationships - respect & dignity of people	Question not specifically asked - but in discussion there was a focus on misconduct/poor practices rather than good conduct.

		- Are research integrity and researcher integrity different? - agreement that they are different Researcher integrity = ethical behaviour, Research integrity = well done research Research ethics - deception		
UK	1. Personal actions - intention, can make mistakes - competency - Honesty & transparency - open about bias, conflict of interests 2. Good methodological practices - Transparency of data & methods - replication & checking 3. Research Ethics - respect	Hard to define & categorise 1. Being a good and moral person/scientist important - Interpersonal relationships 2. Doing good science - different things for different disciplines - competency to judge Judging good science clearer	1. As senior researchers - responsibility to team & junior members - managing conflict of interests - Obligations to funders Misconduct as lapse in integrity - rotten apples - but also, wider community response to pin-point all blame on individuals - systemic issues can cause misconduct - Definitions of RI standards may vary	1. Official definition - safe, responsible & professional practice of research - researchers need to be aware & compliant 2. Good methods - rigour, openness & transparency 3. Protection of participants 4. Protection of researchers (& institution) - if challenged

	of humans & animals, adhering to rules - data management, confidentiality - Important for trust in scientific community	than judging being a good person - serious misconduct by 'rotten apples' - individuals	between countries/disciplines - ramifications for gender inequality	

3rd order constructs: defining research integrity

Translation of studies: 3rd order constructs	Description	Focus groups
Difficulties in definition	Factors identified by participants making research integrity hard to define, boundaries of the concept	EJR, EMR NJR, NRO IJR, IMR UMR, USR
Methodological aspects	Aspects of research integrity pertaining to good science or good research practices more generally	EJR, EMR, ESR, ERO NJR, NMR, NSR, NRO IJR, IMR, ISR UJR, UMR, USR, URO
Personal aspects	Being a good person or acting with good character, obeying rules & ethical guidelines	EJR, ESR NJR, NMR, NSR IMR, ISR UJR, UMR, USR, URO
Social aspects	Respecting people: participants, co-workers & responsibilities for team members. But also, usefulness of research for society	EJR, EMR, ESR NJR IMR UJR, UMR, USR, URO

Importance of research integrity – question posed to Research managers/admin/governance

2nd order constructs: importance of integrity

Country	Research managers/Admin/ Governance
Estonia	Not reported
Norway	Not reported
Italy	Not reported
UK	1. Trust - public trust & trust amongst scientists - Reliable and responsible research 2. Legitimising research - RI in terms of good methods = robust & reliable findings & consistency & transparency in planning & oversight 3. Meeting funder & publication requirements - open data

Is research integrity discussed often amongst colleagues?

2nd order constructs: discussions about integrity

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ Governance
Estonia	Not reported	Not reported	Not reported	Not reported
Norway	most of the discussions about integrity were with her PhD-supervisor Raising questions about integrity can be difficult for young and unexperienced researchers, and, according to our informant, it	Discussions occur but there are barriers to good discussions -Time needed -Difficult to raise issues - lack experiences & cultural difference amplifies this	Not stated explicitly in discussion but arose in conversation. 3 different types of discussions: integrity in commissioned research, co-authorship, and collegial feedback.	- Integrity is often discussed which is important for promoting it - barriers for productive discussion: - sensitive questions - power imbalance/institutional hierarchy - talking to people you know

	can have a negative effect on one's career prospects.	Special positions – union rep/on a committee = more discussions		- Difference between discussing integrity as abstract phenomena/specific cases – raises practical considerations - knowledge gap between admin & research staff
Italy	one participant mentioned that they had discussed integrity and malpractices with colleagues once.	Not reported	Some participants have discussed with colleagues about possible projects that could encourage a culture of research integrity	Not reported
UK	- Not something that is discussed a great deal. - Issues thought to be common sense - Topic not in fashion - But occasionally naturally comes up in conversation - Discussions in stats, but	Sometimes - issues around social interactions discussed with close friends/colleagues - Good science discussed with students – teaching Some discussions may be easier to have than others	- Yes, but not often - interpersonal aspects of integrity - serious cases e.g. Stapel get researchers talking - discussion with students	Not reported

	not always labelled as research integrity			

3rd order constructs: discussions about research integrity

Translation of studies: 3rd order constructs	Description	Focus groups
Difficult discussions	Perceived barriers making discussions about research integrity difficult	NJR, NMR, NSR, NRO UJR, UMR
Productive discussions	Educational, purposeful discussions about research integrity	NJR, NMR, NSR, NRO IJR, ISR UJR, UMR, USR

Barriers or challenges to research integrity

2nd order constructs: barriers and challenges to research integrity

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. Impact of commercial & political interests on science 2. Smallness and closeness of the Estonian (scientific) society	Deviations from good scientific practices traced to current 'scientific climate' 1. insecurity of funding 2. Unsuitable system of evaluation of science - pressures to publish/hype research & abuse of system will affect the quality of research and the nature of scientific community, as well as distortions to the transfer of scientific knowledge into society	1. A challenge reported unique to this group is the role of scientists as experts in society 2. Current science policy & system - pressures & changes	- Treatment of subordinates - grey areas of malpractice originated from current volatile and highly competitive environment that most scientists work in - workload and employment security
Norway	1. Publishing research 2. Power imbalance 1. integrity standards might be too abstract and also lofty legal standards may be incompatible with integrity 2. Lack of transparency-	-Commissioned research problems -Difficulties in accessing data in repositories -Lack of institutional support system to help researchers deal with problems - Time pressures - Incompetency & Confusion	bureaucracy or challenges that are a result of the nature of commissioned research.1. Commissioned research issues 2. Pressure - to publish 3. Lack of support & leadership at institutions	1. commissioned research: - dependent on funders = conflict if findings not to the commissioners' liking 2. Competition: for commissioned research and other- economically rewarding to not have too much integrity

	time and capacity restraints = difficult to check work		Barriers to promoting integrity: -Power structures, imbalances & abuse of power - Time constraints - Research ethics bureaucracy	3. Small country - limited social networks - lack of competency
Italy	- Flaws in the evaluation process - Flaws in peer reviewing system - Absence of training - Publish or perish Conflicts of interests: 1. System-Problem with allowing PhDs to first author 2. Working with private companies	- Publish or perish - Not sharing data - Access to funding - Peer review system - Problems with MSc level research - Problems with imperialism of English language & Anglo-American topics - Ethical dilemmas of research in the field	1. Absence of a culture of integrity & lack of sanctions 2. Difficulties for whistleblowers - Pressures to publish & demonstrate usefulness of research - Low quality journals, predatory journals - Increasing quantitative evaluation of research - Authorship pressures - Patents	- Evaluation system leads to low quality - Systemic problems - entire system - Italy = nepotism - Problems with peer review - continuous legislative/regulatory changes Conflicts of interest often exist between researchers & funding institutions

UK	1. Competency of researchers - expecting 'all-rounders' 2. Communication between disciplines - interdisciplinary work & lack of support 3. Pressures: -Time, difficulties of temporary contracts, 4. Problems with publishing system 5. Supervision	1. Research culture - can encourage poor practice/misconduct 2. Pressures 3. Publishing problems 4. Research collaborations 5. Growing commercialisation of research	Pressures: Time & publishing - Peer review - time pressures - Increased competition especially commercial sectors - Pressures for early career researchers Times have changed, are they harder? - Incentive structures do not encourage RI	1. Research ethics process & Bureaucracy - perceived barrier 2. Pressures for researchers - time & workload 3. Lack of resources/investment in Research integrity work 4. Information overload & accessibility of policies 5. Research culture can hinder 6. Translating policy

Barriers and challenges: 3rd order constructs

Translation of studies: 3rd order constructs	Description	Focus groups
Systemic problems	Funding, evaluation, publishing issues, incentive structures and country specific problems	EJR, EMR, ESR, ERO NJR, NMR, NSR, NRO IJR, IMR, ISR, IRO UJR, UMR, USR, URO
Pressures of the academic work environment	Time, workload, publish or perish	EMR, ESR NJR, NMR, NSR IJR, ISR

		UJR, UMR, USR, URO
Problems with research culture	Approaches to research work, leadership and support, power imbalances	EMR, ESR NJR, NMR, NSR, NRO IMR, ISR UJR, UMR, USR, URO
Conflicts of interest	Stemming from collaboration: between academic/industry, different disciplines	EJR, ESR NMR, NSR, NRO IJR, IMR, ISR, IRO UMR, URO
Accessibility & translation of policies	Researcher's ability to find and use policies in the context of their work	NJR URO

Main risks faced at your institution – question posed to research managers/admin/governance staff

2nd order constructs: main risks at institution

Country	Research managers/Admin/ governance
Estonia	Not reported
Norway	Not reported
Italy	Not reported
UK	- Lack of resources (money) & greater numbers of students - Inconsistencies in ethical review - industry/academic collaborations

Knowledge and impact of research integrity policies

Knowledge & awareness of policies

2nd order constructs: knowledge and awareness of policies

Country	Junior Researchers	Mid-level Researchers	Senior Researchers
Estonia	1. Knowledge varied among participants 2. Confident that regulations are in place	Participants had awareness of international and planned, up-coming Estonian research integrity code of conduct	The participants from disciplines where research is subject to exhaustive ethical regulations (like biomedicine) were well aware of existing international guidelines, though there was less recognition of the documents regulating research in Estonia.
Norway	superficial understanding of some ethical guidelines, they only play a marginal role in their work.	not specified, but seemingly some awareness	Mixed experiences with codes of conduct. - Vancouver protocol on co-authorship discussed - low awareness/interest in such documents
Italy	Lack of specific guidelines for RI, but some have sections in their ethical codes - Participants not aware of these or do not see rules as cogent in the environment where they work -Awareness of rules through journals and conference organisers	Participants did not refer to institutional or international policies regarding research integrity (but institution has no policy itself) - Awareness of rules/codes specific to their fields introduced by conference organisers or journals	Researchers should be aware of ethical codes that underpin grant funding Institution does not make researchers aware of the existence of institutional ethical code (there is no specific research integrity code)

	- lack of awareness of institutional rules by some -Signing code of honour when started PhD about plagiarism	- Unspoken rules as well as formalised in scientific communities	
UK	Limited knowledge overall, awareness of data protection, open data policies of funders, contractual obligations with industrial partners	Limited awareness of content of specific RI policies - know where to find them - confident they exist Information overload - lots to read & take in Go-to when needed	Little awareness of specific RI policy or codes - awareness gained through experience - knowledge that policies exist & where to find them - go-to when needed approach

Knowledge & awareness of policies: 3rd order constructs

Translation of studies: 3rd order constructs	Description	Focus groups
General levels of awareness	Individuals awareness of institutional and national policies relating to research integrity	EJR, EMR, ESR NJR, NSR IJR, IMR, ISR UJR, UMR, USR
Knowledge on a need to know basis	Awareness and knowledge of policies developed by researchers as and when they encounter circumstances	NMR IJR, IMR UMR, USR
Confidence that policies exist	Despite not having full awareness of policies, researchers are confident that they are available should they need to consult them	EJR UMR

Experiential awareness about research integrity rules	Researchers gain an awareness of rules and policy through their experience, not necessarily by consulting policy documents directly	NSR IMR USR
Responsibility	Institutions and researchers have a responsibility to raise awareness and knowledge of policies	IJR, ISR

Policies in existence at institutions: Question posed to Research admin/managers/governance advisors

2nd order constructs: policies at institutions

Country	Research managers/Admin/ Governance
Estonia	Not reported - but mention of new Estonian Code of Conduct for Research Integrity in general discussion
Norway	Not reported
Italy	Institution has an ethics committee for human research - provide opinion on research according to national and international ethics requirements, but this is not mandatory. Ethics commission committee - deals with misconduct - opinion to the senate - no specific guidelines for research integrity - follows ethics code - professional duties only partly dealing with bad practices. No register of cases.
UK	Lots of different policies relating to different aspects of RI - broadly described - many stem from UK concordat to support RI - Data protection = big issue - financial repercussions

Effectiveness of policies

2nd order constructs: Perceived effectiveness of policies

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. Differences in regulation between countries and disciplines 2. REC at institution 3. participants were confident of the functioning of efficient mechanisms for regulating (individual) scientific research, they were less certain of the efficient procedures at place at the university for regulating malpractices related to professional relations	Sceptical about effectiveness of written policies: 1. lack of sanctioning power 2. Alienating - formal institutional nature 3. Greater efficiency of peer pressure in the scientific community 4. Policies - lead to overregulation & unnecessary bureaucracy Useful - for teaching & as reference materials, also keeping good research principles on the agenda institutional: helpful in	Caution of new regulation: 1. Fear of overregulation 2. Existing institutional mechanisms & practices thought to work well 3. instead of written regulation emphasis should be on training through positive examples of peers	Participants were **not in agreement** about the utility of research integrity documents in regulating research practices. 1. Problems with documents: - Formality with no practical impact - Not keeping up with real life - difficulties of practical implementation -potential for increasing administrative burden - Fear of creating overregulation **2. Support of documents:** - reinforcing a culture of research integrity - Creating discussion/raising awareness

		disputes with institution or group outside the university Problem in challenging people in more senior positions - ungrounded fear?		- empowering lower-ranking research staff 3. Ideal type of RI document: - minimalism - avoidance of overregulation - advisory, not sanctioning - focus on good practice
Norway	Not reported	Codes of conduct useful when in doubt Scepticism about usefulness - codes cannot provide answer in all situations, sometimes best to consult with others who have handled similar situations	Vancouver Protocol on Co-authorship was focus of discussion - Guidelines can be helpful & effective, supportive when arguing against illegitimate co-authorship, but also guidelines can be demanding	not reported
Italy	Even if the institutional code of ethics has some articles on research integrity, they are neither effective nor operative, no-	Lack of specific institutional policies, plagiarism dealt with by supervisors, may not be consistent, no-one cares - lack of control	The institutional ethical code is ineffective because 1. no-one has awareness of it (including heads of departments), researchers are not informed about it	On the REC: Positive - protection of researchers from encountering problems in development of projects

	one explains the rules or principles to students or young researchers. - Reports that students at MSc level have no idea about misconduct and plagiarise without realising this wrong practice. - No one knows who is in charge of controlling students or ensuring integrity		2. It is not clear who is responsible for enforcing the sanctions set out in the code 3. There is a lack of training & information - lacking a culture of integrity	Negative - Time - can interfere with submission of projects - increase researcher's workload - limit freedom of research REC would work better if submission of projects was mandatory Ethics Commission - not effective - obstacle = detection & reporting of suspected misconduct - Not clear how institution is supposed to deal with misconduct.
UK	Informational overload: many long documents, no time to read them all	Sceptical about usefulness of policies in practice - subtle aspects of RI: interpersonal issues - too general = cannot deal with	Policies can be helpful BUT: - policies can be burdensome in practice - not fit for purpose Journal policies:	Policies are helpful - outline clear process hard to judge effectiveness: - encountered few allegations - lack of oversight/follow-up

		disciplinary differences - policies are important but need to be made relevant & reviewed Research culture important to make policies effective	- superficial/ box ticking - left to researchers to interpret Policies keep changing so hard to keep up-to-date - information overload Scepticism about consultation/research to develop policies - more tick-boxes - burdensome amounts of information	Fit-for-purpose? - policies may have unforeseen implications for research - interpretation or refinement of policy - importance of stakeholder consultation in policy development - importance of evolving policies/reviews

3rd order constructs: Perceived effectiveness of policies

Translation of studies: 3rd order constructs	Description	Focus groups
Lacking policy and procedures	Identified gaps in policy and procedures relating to research integrity	EJR IJR, IMR, ISR
Challenges to effective policy implementation	Various factors that challenge the effectiveness of policies	EJR, EMR, ERO NMR, NSR IJR, IMR, ISR, IRO UJR, UMR, USR, URO
Helpful policies	Factors deemed important to make policies effective and fit-for-purpose	EJR, EMR, ESR, ERO NSR IRO

		UMR, URO
Fears of overregulation	Concerns about superficial tick-box policies	EJR, EMR, ESR, ERO USR

Effectiveness of sanctions

2nd order constructs: sanctions

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. Sanctions/regulations are needed in some situations e.g. plagiarism View that research integrity should be left mostly to the self-regulation of the scientific community	Scepticism about sanctioning power of policies	not reported explicitly but some 1st order reference to this	Not reported individually but participants thought that ideal RI document should be advisory, not sanctioning - rather focussing on good practice
Norway	Not reported	Not reported	not reported	Sanctions & punishments are needed but may not be enough to make cultures that promote integrity
Italy	- self plagiarism is sanctioned with exclusion from the doctoral school. -Lack of clarity about rules and sanctions -Belief that authorities often do	- Aware of anti-plagiarism software use - used on students at discretion of faculties	not reported explicitly but some reference to lack of enforcement of sanctions at institution. A	Ethics Code establishes sanctions at the institution. A disciplinary commission deals with reprimands -

	not punish, but rather cover and justify cases of plagiarism	- Cases of plagiarism dealt with by supervisors - a consistent lack of control	view that sanctions should be enforced	formal reprimand, formal reprimand plus reporting, or formal reprimand, reporting & temporary suspension.
UK	Awareness of data protection sanctions, but unsure of others	Not reported	Not reported	-Unsure about sanctions - Intentional & serious cases - dealt with by senior members of institution - level of secrecy - external sanctions - journal retractions - Concern that sanctions may prevent people being open about mistakes - important to learn from mistakes rather than focus on punishments

3rd order constructs: sanctions

Translation of studies: 3rd order constructs	Description	Focus groups
Lack of clarity	Lack of awareness regarding sanctions within institutions	IJR, IMR, ISR UJR, URO
Support of sanctions	Sanctions have a place in dealing with misconduct	ESR NRO ISR URO
Scepticism regarding effectiveness of sanctions	Different reasons limiting the effectiveness of sanctions: lack of enforcement, concerns that sanctions could prevent openness/reporting, the need for more than sanctions	ERO NRO IRO URO

Research integrity education & support

Learning about research integrity

2nd order constructs: learning about research integrity

Country	Junior Researchers	Mid-level Researchers	Senior Researchers
Estonia	1. the most general principles are explicitly covered by specific courses at the university 2. the more precise principles related to the conducting research in specific disciplines are the responsibility of the supervisor or is obtained more implicitly through observing colleagues - seen to be problematic, by being too dependent on the effort of an individual supervisor	Teaching on 2 levels: 1. Explicit learning, teaching & feedback 2. Socialising into the norms of the wider scientific community It is obligation of supervisors to ensure that next generation of researchers have learnt principles of research integrity.	Combination of: 1. Implicit process of learning through role models 2. Conscious actions by supervisors 3. Explicit teaching of norms (from as early as possible)
Norway	**1. learned about integrity standards during their studies** - methodology - maintaining one's integrity is equated with upholding methodological norms. BUT - need to be followed up and enforced when students do independent work **2. Helping oneself -** learning as one faces problems during research BUT - incentives	not reported	not reported

Italy	1. by their own 2. Through supervisors - no training provided by institution	Learnt by self No teaching at University	1. Learning from other researchers - role models - discussion amongst peers 2. Personal initiative
UK	1. Teaching - good research methods & citations - explicit & implicit learning 2. Learning through others - research groups & role models & research ethics committees	- Apprenticeship - learning from supervisors/seniors - teaching students - discussion with colleagues Importance of research culture	Extreme apprentice - learning through doing - importance of supervisors & mentors - inconsistency?

3rd order constructs: learning about research integrity

Translation of studies: 3rd order constructs	Description	Focus groups
Explicit learning	Institutional training & purposeful education of oneself	EJR, ESR NJR IJR, IMR UJR, USR
Implicit learning	Researchers learn about research integrity implicitly through their work: role models, supervision, research culture	EJR, ESR NJR IJR, IMR UJR, USR
Learning concerns	Lack of training, ineffective training, poor role models/research culture, incongruence between training & incentives	EJR NJR USR

Promoting research integrity & researcher needs

2nd order constructs: promoting research integrity & researcher needs

Country	Junior Researchers	Mid-level Researchers	Senior Researchers	Research managers/Admin/ governance
Estonia	1. creating a specific position in the administration concerned with consulting in case of conflict, 2. co-ordinated teaching of research ethics at the MA level instead of relying on individual supervisors, 3. finding a balance between competition and job security to lessen the pressure of the highly competitive scientific environment and the accompanying "flexing" of research integrity norms, which however would need the overhaul of the whole scientific system Also- Raising awareness - Institutional mechanisms overseeing and consulting cases of conflict related to research misconduct were	1. General level: amend the current scientific evaluation system - greater role to the internal feedback by the scientific community and to better accommodate the different publishing practices of scientific disciplines 2. **better solve the disputes around cases involving research integrity -** Creation an "ombudsman"-like institution for arbitration of conflicts between people 3. Bringing together different stakeholders involved in the issues of research integrity to create a common understanding of the topic, based on the observation of the inherent tensions within the	Ranging from improving general working environment to concrete suggestions how to uproot malpractices & make improvements 1) Granting more freedom (from constant evaluation and monitoring) and (financial) security to the scientists, space to reflect and regain creativity, a core component of good research 2) Implementing stricter sanctions for scientific malpractices 3) Improving publication policies by opening articles up to community (post-)review, breaking up the	**Suggestions for improvement** -opportunities for increasing research integrity were seen less in providing more regulations or guidelines, but rather in attempts to create a buffer from the outside turbulence, so that the scientists were free to pursue science in accordance to their best understanding and feel less inclined to take up more dubious practices these practices under pressure, through regulating the workload and providing enough (employment) security for the scientists

	seen as also tools to raise awareness	scientific field on two axis: from one hand the administrators vs academics, on the other hand the "realpolitical" power-relations within the scientific community which influence also the acceptance of any proposed regulations of research integrity or other science-policy suggestions	financial monopoly of publishers 4) Improving the science evaluation and grant distribution system, firstly by (1) not accepting the current unfair system by the community itself, secondly by (2) making it more nuanced and considerate of disciplinary differences, as well as prioritising quality over quantity through more thorough grant application review	
Norway	1. More stable contracts - difficult to challenge = threats to career, incentive to cheat - publication pressures 2. Measuring and rewarding integrity - make integrity a tellekant - "tellekant" is used for anything that is quantified and measured in academia. The "tellekants" are often used as a basis for the	1. Training & education especially before starting PhD - obligatory web course 2. Institutional support & assistance - access to competence in integrity 3. Spaces where integrity questions are systematically discussed	*material conditions of the research, local research leadership and the education of researchers - Political responsibility* Transparency & openness about the whole research process - allow others to assess quality of work Administration who have solid understanding of	1. Compliance: - Clear guidelines - Courses (especially for those without a PhD) 2. Reward systems & incentives: - pushed by funders (learnt from working in another culture) 3. Building integrity into the research culture

	distribution of funds. 3. Rigorous training in citation practices - strengthen education when it comes to citations - Weakness in current training		how research works Good support systems & leadership - especially in commissioned research - leaders should reallocate resources to maintain integrity of research & individuals	
Italy	1. More time for research and less pressure to publish 2. increased transparency about conflicts of interest and open access to data 3. More funds for research - replication 4. Institutions take responsibility as well as individuals	Training for students to teach them how to behave honestly Students by time write thesis should already know - Vademecum (handbook/guide) rather than course needed Sanctions should be imposed for cases of plagiarism among students	1. Developing a culture of integrity - discourage bad, encourage good & the role of management/leaders - raise awareness 2. Training PhD students 3. Protection of whistle blowers 4. Proper procedures to enforce ethical code & manage misconduct at institution including applying sanctions	- Journal guidelines - training researchers/promoting tools - promoting discussion - Change in the evaluation - Focus on the concept of transparency - Public reports on ethics commission activities (misconduct) - REC - should be mandatory - Researchers have individual responsibility to act with integrity

				- Research culture - internal status of disciplines - strong & well founded e.g. clear rules/sanctions = influence researcher behaviour - clear regulatory framework (currently unclear & unsettled) - Affirm ethical principle that can be shared but tuned to requirements of each discipline - disciplinary differences
UK	1. Educational tools - online training about research integrity 2. Research culture that supports research integrity - resilience & break down hierarchies - encourage openness & honesty 3. Adequately accounting for research work in planning & funding	1. Raising awareness about integrity: develop training & tools 2. Education: - junior - next generation - senior researchers - need to educate young & who are influential/decision makers Tools or education:	1. Incentives that are compatible with RI 2. Practical tools: - software solutions facilitating research - sharing documents/archiving/communication amongst research team 3. Training - junior & senior - raise awareness 4. Leading by example:	1. Training - spreading message about RI - discursive/face-to-face valued because interactive & engaging - more reassuring than on-line tools - different seniorities - resource heavy/inconsistent application? - Dilemma game - case based learning

	4. Changes to publishing system - publishing negative findings, number of publications not only judgement of researchers	- need for examples/cases - contextualised - made relevant for different levels of seniority - promote discussion rather than tick-box - lead by example/role models/mentors 3. Building integrity into the research culture - senior management lead the way -Useful to have an 'Integrity Tsar' - competent person - development & discussion of values amongst community - Community values - discipline relevant - discussion between individuals - pressures can be detrimental to research culture - openness	Senior to junior pass on good practices - role models -But - who is suitable? - research & researcher integrity 5. Promoting discussion - part of training - within research groups Keep up-to-date with best practices - case studies & real-life examples Better than box ticking Practical help - speaking 'our' language rather than more policies 6. Adopting a positive approach to promote RI 7. Involving academics in	- need senior researchers involved in delivery - learning from other's mistakes & break down academic hierarchies But, not all can be open about mistakes - Research integrity champions - engage peers & speak their language But careful not to over-burden busy researchers willing to help 2. Research culture: -discussions across academic hierarchies - support from top = important 3. Collaboration between researchers & professional services staff

		4. Setting community standards: reproducibility - bottom-up consultation - resources as a hindrance - institutions favour tick-box 5. Reforming processes - publication & peer review - open (un-blinded) peer review - anonymity doesn't always work - small research communities - But problems for junior researchers (vulnerable)	development of tools/training - fit for purpose - not one size fits all - need to be relevant to different disciplines 8. Training & discussions have limitations - some people will still commit misconduct	4. Consultation with researchers 5. Follow-up & checking post ethical review - lack resources prevents this 6. Collective action & collaboration across institutions

3rd order constructs: Promoting integrity & researcher needs

Translation of studies: 3rd order constructs	Description	Focus groups
Systemic changes	Changes to systems of research evaluation and funding: incentives, publication, peer review	EJR, EMR, ESR NJR, NSR, NRO IJR, IRO UJR, UMR, USR, URO
Building a positive research culture	Institutional and individual researcher responsibilities: raising awareness, support, leadership collaborative approach to policies	EJR, EMR, ESR NMR, NSR, NRO IJR, IMR, ISR, IRO UJR, UMR, USR, URO
Improving researcher working environment	Work contracts, support, academic workloads	EJR, ESR, ERO NJR, NSR IJR UJR, URO
Training	Training recommendations	NJR, NMR, NSR, NRO IJR, IMR, ISR, IRO UJR, UMR, USR, URG
Practical tools	Development of practical tools to facilitate research work	NMR UJR, UMR, USR