Facilitating development of research ethics and integrity leadership competencies

Tammeleht, Anu

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Anu Tammeleht[1,2]* , Erika Löfström[1] and ja María Jesús Rodríguez-Triana[2]

* Correspondence: anu.tammeleht@
helsinki.fi
[1]University of Helsinki,
Yliopistonkatu 4, 00100 Helsinki,
Finland
[2]Tallinn University, Narva mnt 25,
10120 Tallinn, Estonia

Abstract

To build a culture of integrity in a HE institution, innovative approaches are needed to enhance education of research ethics and integrity (REI). In addition to educating students, understanding is needed on how to facilitate for those who lead others. The focus is on early-career researchers (ECRs) as future REI leaders. The current study sheds light on how learning and REI leadership competencies evolve during scaffolded collaborative research ethics training for this target group. The study combines new instruments as part of holistic DBR. Data was collected from 3 groups of experienced researchers attending 3 training sessions in the form of written group reports and group discussion recordings. Qualitative deductive analysis was utilised for monitoring the learning process, scaffolding patterns, and display of REI leadership principles. Also, quantitative analysis was applied to group discussion data, displaying the nature of collaboration. Results imply that collaborative case-based role play format is effective in training future REI leaders. All groups displayed high levels of understanding. Combining ECRs and researchers with leadership experience supported knowledge building in the groups by bringing in various perspectives. Even though groups required different amounts of scaffolding, the nature was similar: maintaining goal orientation, highlighting critical features and redirecting learners. Learning analytics of collaboration indicated that the person with leadership experience was not necessarily the most active participant nor took the role of a 'group leader'. Still, it was mostly that person who displayed leadership competencies thus supporting other group members to develop leadership aspects.

Keywords: Research ethics, Research integrity, Leadership, Design-based research, Early-career researchers

Introduction

In order for higher education (HE) institutions to thrive, attention should be paid to building a culture of integrity in academia (Bertram Gallant 2011). As Martin (2017) states 'ensuring [university] integrity is vital' (p 10) as this pertains to universities' reputation and the society's trust towards research and teaching. Ethics and integrity in academia are systemic entities and require leadership and a strategy, namely, leaders should anticipate problems, should perceive them accurately and be ready to provide solutions as the need arises (Bertram Gallant 2008, 2011). This calls for educating

research ethics and integrity (REI) leaders who would build the culture of integrity in HE institutions by creating an environment where everyone can and will make ethical decisions. Even though there are training materials that give guidance on research ethics and integrity at an institution (e.g. codes of conduct, guidelines, handbooks, online banks of resources) there is limited information about how the learning process evolves and what kind of scaffolding supports this target group.

We use the terms 'research ethics' and 'research integrity' in the current study. By 'research ethics' we mean the application of fundamental ethical principles and guidelines to research as stipulated by, for example, the Belmont Report (1978) and the Declaration of Helsinki (World Medical Association 2001). By 'research integrity' we mean behaviours and responsibilities guided by ethical principles and common values generally accepted in research communities (e.g. ALLEA 2017, Estonian National Code of Conduct for Research Integrity *Hea Teadustava* 2017, etc.). There are alternative terms, such as 'academic ethics' and 'academic integrity', which have been defined in a variety of ways, and are often connected to student cheating and plagiarism (e.g. Bertram Gallant 2008; Macfarlane et al. 2014; Lowe et al. 2018). We chose the term 'research ethics and integrity' as this includes both guidelines/principles and behaviours in research context as well as the leadership thereof. Codes of conduct (e.g. ALLEA 2017) outline responsibilities of leaders to provide guidelines, infrastructure and encouragement. This study focuses on competencies necessary for 'research ethics and integrity (REI) leadership'.

In this article, *REI leadership* means leadership on departmental and organisational level in the HE context and is a combination of principles from ethical, authentic and transcendental leadership styles. A *REI leader* would coincide with phases 3–5 in the *Vitae Researcher Development Framework* (2011), where the person would not only act as an exemplar and someone who sets high expectations, but who would also advise others and shape institutional policies and practices (similar to 'ethical leadership' of Brown and Treviño 2006). The current study focuses on early-career researchers (ECRs) as future REI leaders, who are both learners and gradually becoming teachers and role-models of others. ECRs are often regarded as a vulnerable group in a junction of being learners, teachers and researchers (Rao et al. 2021), and are seldom recognised as future REI leaders. Consequently, not much is known on how to support this group as a piece in the ethics infrastructure and what the institutional infrastructure would need to facilitate this group. The vital question becomes that of preparing these individuals to build a culture of integrity. The underlying premise for the current research is that a culture of integrity is facilitated through training ECRs to develop qualities and competencies of REI leadership.

The purpose of this article is to shed light on how learning and REI leadership competencies evolve during scaffolded collaborative training. To understand the learning process and scaffolding needs of this target group, knowledge building process, scaffolding patterns and display of REI leadership principles were scrutinised as part of holistic DBR.

Theoretical framework

Research ethics and integrity, and the systems approach

The core duties of universities are stipulated as teaching, research and serving the society (Altbach 2008; Bertram Gallant 2011). To carry out these duties all the levels in the

research institution (individual, departmental and institutional) are intertwined and interdependent, collaborating and developing mutual trust through implementing institutional values and high standards. Seeing the entire institution as a system where all the stakeholders influence one another contributes to development of a culture of integrity. Research ethics and integrity are core competencies in research and teaching, and are an essential requirement in higher education institutions (Anderson et al. 2013).

In addition, research ethics does not mean only being guided by rules and sanctions, the focus should be on seeing research ethics as a positive force guiding the entire research community towards the greater good (Mustajoki and Mustajoki 2017). Research ethics and integrity is gaining more prominence due to various factors, e.g. the increasing body of researchers and globalisation (leading towards greater competition), technological advances (more occasions of plagiarism), accountability and so on (Bertram Gallant 2011; Mustajoki and Mustajoki 2017). The focus on positive behaviour and developing research ethics and integrity competencies is also important in bringing up the next generation of researchers and leaders, especially in countries where more trust is put on researchers (e.g. an ethics review not being a requirement for every kind of research). All this puts research ethics and integrity training in the forefront of fulfilling the core duties of universities - teaching, research and serving the society.

Ethics and integrity education

Ethics and integrity education in this study is put in the context of applied ethics, which deals with practical ethical issues of a certain domain, in this case research ethics and integrity. There are two perspectives to ethics education that are in focus: which pedagogies are effective and how learning could be supported.

There are various pedagogies used in ethics education. A literature review of articles published in the past 20 years of the effectiveness of strategies used to teach integrity (mostly in the context of student misconduct and plagiarism) shows that face-to-face direct instruction has been the most prevailing method, in the past decade e-courses and blended learning have become more popular (Stoesz and Yudintseva 2018). Methods described included presenting content by the instructor, in writing or video tutorial, discussions with peers or instructors, practical classroom and home assignments, and short quizzes (Stoesz and Yudintseva 2018; Ford and Hughes 2012; Chertok et al. 2013; Bendriss et al. 2015; Henslee et al. 2015). No one method proved to be more effective than others, even though teacher feedback and problem-based learning were perceived as effective elements in instruction (Stoesz and Yudintseva 2018). There is also research to support that knowledge about academic integrity can be facilitated through online courses (Lowe et al. 2018). In addition, role-play has been reported as an effective method to develop research ethics competencies among ECRs enabling learners recognise various perspectives and practice behaviours in life-like situations (Löfström 2016).

Moreover, research indicates that case-based collaborative learning is effective in developing research ethics and integrity competencies (Johnson et al. 2012; Bagdasarov et al. 2013; Tammeleht et al. 2019, 2020). Case-based learning can be used in most fields where students engage in real-life dilemmas (Biggs and Tang 2007) and, in

particular, the use of ethical dilemma cases has been found to be effective in ethics education (Fisher and Kuther 1997; Clarkeburn 2002; Zucchero 2008; Jordan et al. 2013; Rissanen and Löfström 2014). Dealing with cases enhances understanding of the topic, helps put theory into practice (Biggs and Tang 2007), and facilitates understanding of the context by enhancing mental representations (Ericsson 2007).

Various theories can be applied to support learning about research ethics and integrity. Most of them combine collaboration and scaffolding.

First, the *knowledge building theory* (KBT, Scardamalia and Bereiter 2006) proposes a collaborative effort for advancing mutual understanding and knowledge. In the context of KBT, the group learns by building and sharing knowledge and interacting with the learning environment (e.g. a task). Discourse is an important element to synchronise understanding and the content is not focused on factual knowledge alone: when the teacher or textbook provides additional information, this is evaluated by the group, the understanding may be elaborated and also new ideas may emerge. Groups also create collaboratively 'epistemic objects' - artefacts that reflect the advancement of knowledge or co-creation of knowledge. Developing research ethics competencies also happens collaboratively while learners build their mutual understanding (Authors in press).

Second, Vygotsky's (1980) concept of *zone of proximal development* (ZPD) indicates that people can learn in groups what they cannot learn alone by scaffolding provided by more knowledgeable others, including peers. Scaffolding can also be provided by the digital environments and task design. More knowledgeable others could be experts in the field. Ericsson (2007) describes an expert as a person who has mastered the content knowledge and skills of a domain on a level that allows them to solve the problems accurately and effectively even in conditions that cannot be foreseen. Löfström et al. (2019) have proposed that knowledge on expert strategies on solving ethical problems may benefit REI training for non-expert groups.

Third, in the *Computer-Supported Collaborative Learning* (CSCL) approach, knowledge is a product of collaborative work, and the role of technology is to support collaboration and knowledge building processes that would be challenging to organise without digital tools (Stahl 2002; Stahl and Hakkarainen 2021). Scardamalia (2002) emphasises that learning with the support of computers and collaboratively is not linear, the questions are often open-ended, knowledge is co-created, groups work on expanding epistemic objects and do so iteratively to refine the knowledge - such a learning process cannot be fully scripted, but it can be scaffolded.

Fourth, *scaffolding* as a teaching strategy originates from Vygotsky's sociocultural theory and is part of his concept of the ZPD (Vygotsky 1978). Originally, scaffolding was considered an interaction where the 'expert' - a parent, teacher or tutor (Wood et al. 1976) - or a peer (Vygotsky 1978) provided the help needed by the learner, for example, by reducing the complexity of the task, maintaining goal orientation, motivating or providing answers (Wood et al. 1976), and then gradually fade support as expertise increases.

The current research focused on various components of external scaffolding. Chi et al. (2001) consider scaffolding a critical component in facilitating learning, especially highlighting two components of scaffolding: *what* to prompt and *when*. In addition, Riser (2004) claims that scaffolding has two complementary mechanisms: structuring

the task/problem and problematizing the subject matter. Structuring the task means reducing the degree of freedom and maintaining focus (e.g. decomposing complex tasks, focusing effort by giving limited options/pre-selecting data, helping learners monitor what they are learning by using prompts/reminding important goals, etc.). Problematizing means making the learner's work more 'problematic' by eliciting using previous experience to solve the problem (e.g., extending the case/problem, highlighting 'discrepancies', providing help only when asked, keeping the focus, eliciting commitment by provoking learners, etc.). Moreover, Quintana et al. (2004) have developed a scaffolding framework that underlines the threefold challenges that learners face: sense-making, process management and articulation/reflection. External scaffolding also supports obtaining metacognitive strategies of declarative, procedural and conditional knowledge (Shraw and Moshman 1995). Procedural knowledge can be supported by explicit instructions on how to deal with a given task (also described by Chi et al. 2001, Quintana et al. 2004). Conditional knowledge is supported by discussions with peers, and declarative knowledge by monitoring and reflecting ones advancement of understanding (Lai 2011). Thus, by supporting the learning process during REI training by providing information and examples when needed, structuring the tasks, redirecting the learners, and eliciting reflection, advancement in understanding has been detected (Tammeleht et al. 2020).

Leading research ethics and integrity

A historical overview about ethical research governance (Sivasubramaniam et al. 2021) indicates that a wide range of regulations and standards that have been set up starting from the Nuremberg Code 1947 (BMJ 1996), the Declaration of Helsinki 1964 (World Medical Association 2001), the Belmont Report 1974, and others should uphold high standards of research. Research on ethics management and academic integrity policy (Bretag et al. 2011; Anohina-Naumeca et al. 2018) indicates that the way research institutions display their policies and decision-making (hence, acting according to those policies) influences the social trust towards their activities. It appears that leadership competencies in research ethics and integrity context have not received much attention.

'REI leadership' is a novel term and combines elements from ethical, authentic and transcendental leadership concepts and was specifically coined for this study. A new term might be needed to cater for the needs of the HE context. While the term 'ethical leadership' is in use in business (Treviño et al. 2003), it does not fully coincide with the goals of leadership in HE institution. 'Academic leadership' pertains to leaders of higher education institutions (e.g. Olson and Walsh 2019), which is not the direct target group of the current study.

In order to build a culture of integrity the leaders require a set of competencies. First, Trevino et al. (Treviño et al. 2003, Treviño et al. 2006) have outlined the characteristics of ethical leadership as communicating decisions openly and making the decision-making process transparent. Ethical leaders display care for others' needs by listening, showing concern and considering the greater good and long-term best interests of the organisation (Treviño et al. 2003). Their words and actions are aligned which contributes to trustworthiness, they also demonstrate commitment to building the ethical

culture in the organisation (Crews 2015). In addition, ethical leaders are focused on relationships, which refer to fairness, empathy and altruism towards others, but also for oneself (Crews 2015). At the same time ethical leaders still run a business and the main goal is to incentivise employees to work for the benefit of the organisation and making sure rules are followed, described as transactional 'moral person–moral manager' by Brown and Treviño (2006).

Second, the core characteristics of authentic leadership (Avolio and Gardner 2005), claimed to combine elements of various other leadership styles, are self-awareness, building relationships, working hard, leading with a vision, aim and values (Avolio and Gardner 2005). First the leader needs to become aware of 'why am I doing what I do?' - *Why is it important to build an ethical academy? What are my values and beliefs? Are they united with institutional values? How do I show them? What is my vision?* Self-awareness is part of authentic leadership described by Avolio and Gardner (2005), self-awareness also refers to being aware of one's weaknesses and finding means to develop them. Authentic leaders act according to one's values and communicate them to others - building transparent relationships and decision-making processes builds trust and fosters an ethical climate (Avolio and Gardner 2005).

Third, in order to build an ethical academy (see Bertram Gallant 2011) transcendental leadership (Cardona 2000; Sanders et al. 2003; Kezar and Sam 2011) may provide positive results. In HE the members of the community need more autonomy, the networks may be more loosely combined and more trust is put on the individual (Bertram Gallant 2011) and this is the reason why transcendental leadership style may be effective – the leader provides an environment where the 'followers' become exemplars of their own (Cardona 2000). By acting in accordance with one's values and beliefs the leader starts to draw in people who feel the same way – the followers want to identify with the common cause that has value and follow the leader who displays integrity (Cardona 2000). The leader puts the vision into words and inspires with one's passion to lead the team towards the greater good. Human interaction and empathy is the starting point, the leader strives to contribute to the development of the followers (Cardona 2000).

Combining ethical leadership, authentic leadership and transcendental leadership as described above, we synthesised principles of *REI leadership* relevant for a HE context (Table 1). The relevant competencies described by various leadership styles (on the right in the table) were summarised by the authors to coin a principle (1–4, on the left in the table). The synthesised REI leadership framework can be utilised to support development of relevant competencies among present and future REI leaders in HE institutions. These competencies can facilitate building a culture of integrity by considering people's needs, developing the community, personal competencies, and encouraging an open culture.

While there are effective strategies and learning theories to teach research ethics, there is limited knowledge about the learning process of ECRs, especially during REI training which in addition to research ethics focuses on developing leadership competencies. The aim of the current study is to understand how to support the learning process and development of REI leadership competencies in HE context. The following research question was formulated: *How does learning and leadership competencies develop during scaffolded collaborative REI training?*

Table 1 REI leadership principles and respective competencies

Principle	Competencies displaying the principle
1. Considering people's needs	● Considering the people's needs (Cardona 2000) ● Reaching out to the others' needs (Cardona 2000) ● Contributing to the people's personal development (asking: 'do those served grow as persons, do they become healthier, wiser, more autonomous, more likely to serve others?') (Cardona 2000) ● Being concerned with people themselves [empathy and connection with personal life] (Crews 2015; Cardona 2000)
2. Developing the community	● Training and engaging the research community to make common values and beliefs apparent (Treviño et al. 2003; Crews 2015) ● Making sure everyone knows the practices of the institution and actively participating in them (Treviño et al. 2003; Crews 2015) ● Being aware that only people who care about each other are able to disagree and give honest feedback (Cardona 2000)
3. Developing personal competencies	● Having the competence to negotiate, create and communicate vision, making human interaction a habit (Avolio and Gardner 2005) ● Showing integrity and capacity to think of others' needs before one's owns, serving the community, serving first (Cardona 2000) ● If you as a leader reach your limit, you need to be able to forward the issue to a suitable person/institution (Treviño et al. 2003; Crews 2015; Avolio and Gardner 2005)
4. Focusing on open culture	● Making yourself available (open door/ move among your people/ participate in discussions as a partner) (Treviño et al. 2003; Crews 2015) ● Making sure people have the confidence and courage to turn to you (Avolio and Gardner 2005; Cardona 2000)

Method

As the aim of the research was to understand the learning process during RE training, the research was embedded into the pragmatic paradigm and adopted a design-oriented and interventive approach. Within the pragmatic paradigm, design-based research (DBR) is often used (Juuti and Lavonen 2006; Alghamdi and Li 2013). DBR is a systematic research approach focused on understanding and improving educational practices in real-life context through design, development, iterations and implementation, and leading to contextually-sensitive design principles and theory development (Bakker 2018). Also, DBR has demonstrated its potential as an approach suitable to both research and design of technology-enhanced learning environments (Wang and Hannafin 2005). This research follows the holistic DBR model by Reinmann (2020).

Context

The context of the current research was the training session intended for ECRs. The training session involved an online Leadership Level REI resource and was conducted face-to-face. The online resource was designed as part of a larger REI resource: the Leadership Level follows Foundation and Advanced Levels, the entire resource intended for ECRs, but can also be used by bachelor, master's level students (Foundation Level) as well as academics (Advanced and Leadership Levels). The Leadership Level resource supports gradual development of REI competencies in HE context.

The learning outcomes for the Leadership Level REI training are:

1. The participants develop their research ethics competencies by combining previous knowledge and implementing new tools.
2. They can identify and support their decision on which ethical principles (Kitchener 1985) might be at stake in their case.

3. They can utilise the ethical analysis steps (Mustajoki and Mustajoki 2017) to provide solutions to ethical dilemmas.
4. They can implement different ethical approaches to the possible courses of action.
5. They have taken the role of a REI leader and display some REI leadership competencies during their group work.

For the current study a facilitator was present throughout the training session. All the material was available in an online environment (a website), introduction to the material was made by the facilitator. During the group discussion the facilitator did not participate in the discussion and interfered only if the group needed scaffolding (did not know what to do next, started to get side-tracked, needed additional information, etc.).

The online resource first introduced the tools of ethical principles, analysis and approaches. In addition, a table with research ethics leadership principles was provided that would help understand the relevant competencies. The group was asked to take the role of a leadership team and follow the outlined leadership principles.

The resource is divided into sections based on the phases in the research process: planning, conduct, publishing, data management, violations. Each section presents a different case (life-like, invented by the authors, based on the topics covered in the ALLEA (2017) code of conduct), the participants also have a chance to insert their own case and deal with that. All cases are followed by the same tasks (see the example below) excepting the 'Additional Questions' section, which only pertained to the given case. The topics under analysis in this study were the ones all groups had in common: ethical principles (A), stakeholders (B), their rights and responsibilities (C), possible courses of action (D), different ethical approaches (D*) (see an example in Fig. 1). Ideally, groups would meet several times to discuss all the cases and master the ethical analysis tools and practice taking the role of a RE leader. In the current study all groups dealt with one case (different for each group) and met only once.

Description of the training session (about 1 h):

1. A group is compiled (3 participants, 1 with leadership experience), sitting around a table, using 2–3 laptops.
2. Overview of the training session and the online ethics resource (about 10 min).
3. Introduction of RE leadership principles (about 10 min).
4. A case is presented to the group. (5 min)
5. Group discussion and filling in the group report (f2f and online). Following the ethical analysis steps, taking the role of RE leaders (about 30 min).
6. Conclusion/end (5–10 min).

Participants

The participants were recruited in an Estonian university in 2019–2020. The research participants were ECRs and researchers with some leadership experience (supervisory or educational leadership experience). The participants were research colleagues working on the same research project. An email was sent to the research team of the project (of about 20 people). All in all, 9 individuals volunteered to participate, 3 training sessions were organised where participants worked in groups. The groups were

Planning

Before starting with the case please assume a role of a research ethics leader (see the table with leadership principles).

You have been turned to (as a department leader, leadership team) in an informal meeting by a PhD student who asks about the ethics reviews - when are they necessary and how to apply for one? It turns out the student is a part of a new research team and the team has embarked on research involving human research participants (data is being collected already). There are plans to publish articles in a renowned journal. You get the impression that the team may not have been aware of the necessity of the ethics review.

1. Identify what ethical issues emerge in this case (A).

2. Identify, which ethical principles may be present (violated) in this case, justify your answers/give examples (A):

respect for autonomy: ...

doing no harm (non-maleficence): ...

benefiting others (beneficence): ...

being just (justice): ....

being faithful (fidelity): ...

3. Who are the stakeholders? What are their rights and responsibilities? Where do you fit in? (B/C)

4. Envision possible courses of action. (D)

5. Now analyse the courses of action from different perspectives (D*):

Consequentialist	Rule-based	Value-based
1. What would be the outcome? 2. What are the harms and benefits of the outcome? 3. How would different stakeholders feel about the harms and benefits? 4. What are the short- and long-term harms and benefits? 5. Who should make final decision?	1. Which codes of conduct and regulations do you need to follow? 2. What do the rules say about this situation? 3. Does your chosen course of action follow the rules and regulations?	1. If you were the final decision-maker - how would you personally regard this decision? 2. Why would you make this decision? 3. How would a virtuous ("good") person act in this situation? 4. What are the values of the research community and stakeholders?

Additional questions:

- Has there been training on research ethics? Has everyone participated in it?
- What are the needs of the team and its leader?
- Which ethics infrastructure is needed for the beginning research teams?
- How to develop an atmosphere where people feel comfortable about discussing various issues related to the research process?
- If there is not an ethics review board at your institution, how would you advise the team leader to go about?

After doing the tasks you may want to think about and compile your ethics infrastructure (applicable for your institution and research community), including:

- Which codes of conduct apply
- Ethics review/application - Application criteria and format
- Ethics committee
- Publishing requirements
- Data Management Plan
- Preliminary agreements (roles, work division, authorship, etc)
- Training ideas

Fig. 1 An example case from the resource

heterogeneous combining participants from five different nationalities and different disciplinary backgrounds. Each group had two ECRs and one researcher with leadership experience compiled purposefully by one of the authors.

Research ethics

The research followed the European Code of Conduct for Research Integrity (ALLEA 2017), the Estonian National Code of Conduct (Hea Teadustava 2017), as well as the Finnish National Board on Research Integrity guidelines (as the authors are affiliated to institutions located in these two countries). No ethics review was required (from the Estonian or Finnish side) since the study did not involve an intervention in the physical integrity of research participants; deviate from the principle of informed consent; involve participants under the age of 15 being studied without parental consent; expose participants to exceptionally strong stimuli; cause long-term mental harm beyond the risks encountered in normal life; or signify a security risk to subjects. Participation was voluntary, and the participants were asked for their informed consent prior to data collection. The data were anonymized before analyses, and were stored securely in an institutional cloud.

Data collection and analysis

Data were collected from three groups participating in three different Leadership Level RE training sessions. Each group was provided with a shared online document to create a group report. These documents contained visual help as well as questions to guide the group discussion. Usually one group member filled in the group's answers, but this person 'emerged' rather than was designated. Also, the group discussions were recorded with *CoTrack*, a digital solution devoted to assess participation in collaborative learning situations (Chejara et al. 2021), and intelligent verbatim transcription was used for data analysis. The three group members and a facilitator sat facing each other in a square formation and had 2–3 computers to see the online training resource; the online environment was also displayed on the wall with a data projector.

To gain understanding of the learning process and collaboration the data were triangulated from different perspectives combining qualitative and quantitative data analysis methods. Qualitative deductive content analysis was used to evaluate the levels of understanding (SOLO taxonomy), scaffolding patterns (scaffolding framework) and display of REI leadership competencies (REI leadership principles). Quantitative data (turn-taking time and sequence) was analysed with the *CoTrack* device. Four instruments were used for analysis in this study.

Instrument I: Ethical Case Assessment Grid (ECAG)

To display the learning process, the level of group understanding during different tasks was indicated on the Ethical Case Assessment Grid (ECAG) utilising the SOLO taxonomy (Tammeleht et al. 2019). For the current study, the SOLO taxonomy was chosen as it is evidence-based, hierarchical, allows evaluation of learning outcomes in HE settings, is applicable in various fields (Biggs and Tang 2007) and has previously been applied in evaluation of ethical awareness (Löfström 2012). The tasks were focused on different stages of ethical analysis, so each stage had to be analysed separately.

Since the learning activities and the group reports were carried out collaboratively, the unit of analysis was the group.

Both group reports and discussions were analysed based on deductive content analysis. Themes for analysis derived from the tasks of the training material (ethical principles - A, stakeholders – B, their rights and responsibilities - C, possible courses of action - D, different ethical approaches - D*), and the level of understanding was evaluated based on the SOLO taxonomy description (see Appendix I). The results were transferred to the ECAG and the learning progress was also visualised as temporal grids (see Fig. 2 below).

Instrument II: scaffolding framework

In order to analyse the scaffolding techniques and mechanisms a scaffolding framework was used. The framework is based on scaffolding techniques outlined by Chi et al. (2001), scaffolding mechanisms by Reiser (2004) and Quintana et al.'s (2004) scaffolding process framework (also displayed in Tammeleht et al. 2020). Transcriptions were analysed using deductive content analysis, relating the quotes from the transcripts to the proposed framework. The unit of analysis was a whole thought that could comprise of a few words (e.g. 'OK, what else?') to several sentences ('You mentioned …. Have you also considered …? '). The analysis provided information about how much scaffolding was needed as well as the nature of scaffolding provided.

Instrument III: RE leadership principles

The framework for REI leadership principles was compiled for this study based on ethical, authentic and transcendental leadership elements that are relevant for HE context (see Table 1). From the transcriptions all demonstrations of RE leadership principles were identified (considering people's needs; developing the community; development of personal competencies; focusing on open culture). The unit of analysis was the whole thought, e.g. two PhD students discussing stakeholders of the case: '*We are the leaders now, but I would say [other stakeholders are] the research community as a whole or the smaller sub-community, because when things happen, it also sets the stage for other incidents that are similar*' - '*Yeah, and based on how this issue is resolved, later on similar issues will be resolved, [like] additional funding [on] institutional level, the group, department … *'. In the example the participants display that they have taken the role of the leaders and demonstrate the principle of developing the community by mentioning the common values and need to learn from experience. The analysis provided information about which principles were present, to which extent and how they were distributed.

Instrument IV: learning analytics results

Learning analytics was utilised to understand collaboration. *CoTrack* is a device which records audio during collaborative group-work by recording sound from 4 different angles and uses *Voice Activity Detection* and *Direction of Arrival* algorithms to detect participation in group-work (Chejara et al. 2020, 2021). The collected data are presented in graphs displaying speaking time (in this study in 2-min intervals) and turn-taking.

Results

Data from three training sessions were triangulated to gain insights of how the learning and leadership developed during scaffolded collaborative RE training. First the learning process was evaluated based on the ECAG, then scaffolding patterns were analysed based on the scaffolding framework, collaboration was evaluated based on learning analytics, and the display of REI leadership competencies was analysed based on the REI leadership framework.

The ECAG score of the reports displayed knowledge on the multistructural level (2) for all groups. Applying the ECAG to the group discussion recordings, the resulting temporal progress showed that the level of understanding was actually higher than indicated in the reports, reaching the relational level (3) for most topics or even the extended abstract one (4) by the end of discussion (see Fig. 2).

The groups were supposed to follow the training material in the prescribed order to cover all the stages of ethical analysis (A-D*) and reach at least the relational level (3). This was supported by the structural scaffolding provided by the resource. The data indicate (see Fig. 2) that the groups that refrained from going into stage D (providing solutions) until the very end displayed higher levels of understanding also for previous stages. It can also be seen that longer stretches of time devoted to discussing the topic usually provided higher levels of understanding.

On the other hand, based on the temporal grids, it became obvious (see Fig. 2 top) that Group 1 was slightly different - at the beginning of their discussion they were fluctuating from one topic to another (thus not following the task order suggested by the training material) and often displaying unistructural (1) or multistructural levels (2). They had covered all topics by the middle of their discussion but without going into

Fig. 2 Group temporal progress based on ECAG (Group 1- top, Group 2 – middle, Group 3 – bottom)
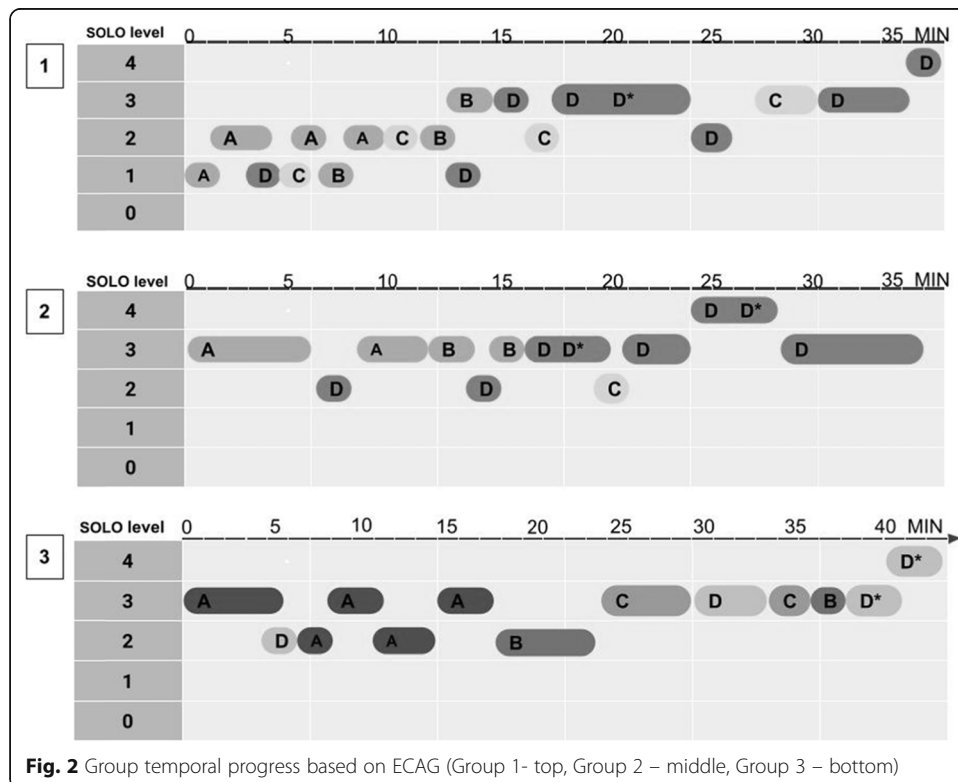
depth. Then, they focused more on the possible courses of action (stage D), occasionally checking other topics as well, and displaying the relational level (3). Eventually, they showed the extended abstract level (4) for topic D. The other two groups displayed a similar pattern in the sense that when the order of topic deviated from the one given in the instructions, the level of understanding was multistructural (2). Nevertheless, Groups 1 and 2 did it only occasionally and usually spent longer stretches of time on discussing the stage suggested by the resource and displayed the relational level (3). The second half of the discussion was usually devoted to the possible courses of action (stage D) and analysing their implications (stage D*), all groups reached the extended abstract level (4) by the end of the training session.

Next, oral scaffolding provided by the facilitator was analysed using the scaffolding framework. First, the amount and nature of oral scaffolding was scrutinised by counting the times and techniques of oral scaffolding based on the transcriptions (see Table 2).

Here, all groups were different: while groups 1 and 3 received scaffolding 42 and 51 times respectively during group discussion, group 2 only received scaffolding 19 times. The nature of oral scaffolding also varied: while Group 1 required more support in sense-making and process management, Group 2 required some support in articulation/reflection and Group 3 in articulation/reflection and process management. Nevertheless, many of the more prevalent scaffolding techniques (RDIR, GOAL, PUMP, GOAL, HIGH) supported maintaining goal orientation, highlighting critical features and redirecting the discussion topics.

Indeed, direct questions were occasionally asked as scaffolding, used in group 1 more than other groups - 13 times. Moreover, executing the step was sometimes needed (i.e. providing the answer when the group needs it and it was crucial for the discussion to move on), used in group 3 more than other groups (10 times). Other scaffolding techniques (e.g. filling in gaps, pumping, extending the case and initiating the reasoning step) were used only on a few occasions. Peer scaffolding was used in groups 1 and 3, but only a few times (to remind others what the task at hand was) and was included in the scaffolding data.

Also pertaining to scaffolding, learning analytics provided information about the talking time of all the participants (see Table 3 below). This gave us insights of facilitator talking time and how much scaffolding (proportionally) was required by groups.

Table 2 Scaffolding analysis results

Scaffolding purpose	Scaffolding technique	Group 1		Group 2		Group 3	
Supporting sense-making	FILL – fill in gaps	4	20	2	3	1	11
	QUES – asking a question	13		1		8	
	EX – providing examples	3		0		2	
Supporting process management	PUMP - pumping	3	17	1	5	7	18
	RDIR – redirecting the learner	10		4		1	
	INRE – initiation he reasoning step	1		0		0	
	EXE – executing part of the task	3		0		10	
Supporting articulation and reflection	GOAL – goal orientation	0	5	6	11	6	22
	HIGH – highlighting critical features	4		5		16	
	EXTEN – extending the situation	1		0		0	
	TOTAL	**42**		**19**		**51**	

Table 3 Total and facilitator speaking time
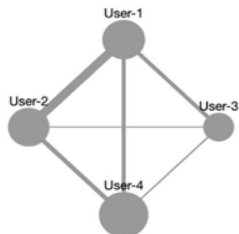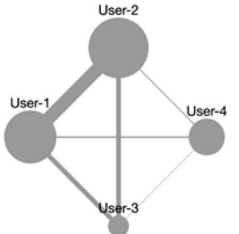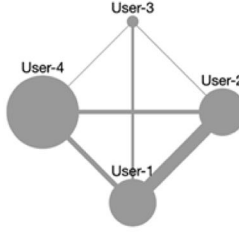
Group	Speaking time graph	Total talking time	Facilitator talking time (min/ %)
1		26 min	Facilitator – User 2 4.14 min/ 15.9 %
2		34 min	Facilitator – User 4 3.8 min/ 11.2 %
3		46 min	Facilitator – User 2 6.5 min/ 14 %

Data indicated that *facilitator talking time* was between 11 and 16% of the total talking time and was targeted towards more active participants. The graphs indicate facilitator talking time (see the relevant User in graphs). In addition, as indicated in the collaboration graphs (see Table 4 below), the facilitator is more connected to those participants who were more active.

Information about collaboration came from the learning analytics results. *CoTrack* device analyses turn-taking of participants (see Table 4). This gave us insights about collaboration patterns in the groups.

As indicated by data (see Table 4), in Group 2, the participant with leadership experience spoke more frequently than other group members. This was also the group that required far less scaffolding and the discussion mainly circulated between the ECRs and the most experienced leader, no peer scaffolding was used. In both groups 1 and 3, the participants with leadership experience did not speak most frequently and were also more connected with the facilitator (i.e. received scaffolding). At the same time, all participants with leadership experience were connected with other group members, indicating that they strived to include everyone. All groups had a person who was less

Table 4 Learning analytics results of collaboration in all groups

Group 1	Group 2	Group 3
User-1: Researcher with leadership experience (M) User-2: Facilitator User-3: ECR (M) User-4: ECR (F)	User-1: ECR (F) User-2: Researcher with leadership experience (F) User-3: ECR (M) User-4: Facilitator	User-1: Participant with leadership experience (F) User-2: Facilitator User-3: ECR (M) User-4: ECR (F)

active than others – it may be by chance that this member was a male (M) ECR; the female (F) ECRs took more initiative. As the role of the facilitator was to provide scaffolding only pertaining to content of the training (and not moderating the discussion), the facilitator was always less connected to the least active member in the group.

Regarding the analysis of REI leadership principles, we used the aforementioned framework (see Instrument III) to assess two aspects: which REI leadership principles were displayed and who demonstrations those principles. The REI leadership principles were displayed quite evenly in all groups (see Fig. 3): group 1–27 times, group 2–29 times, and group 3–31 times. *Considering the followers' needs* was displayed about 10 times, *developing the community* about 11 times, *developing personal competencies* about 6 times and *focusing on open culture* about 3 times. The only exception was group 3 where open culture was not displayed at all.

All groups collectively took the role of REI leaders. This became evident when the groups referred to themselves as '*we*' and talked about '*our responsibility*' (e.g. '*We definitely have a responsibility to safeguard everybody and to make sure people are trained and informed and that procedures and regulations are in place*' – Group 3, ECR 1).

The temporal analysis of transcriptions indicated that the principle of *considering followers' needs* was usually displayed during discussing ethical principles and stakeholders. For example, in Group 2 ECR 1 said: '*So, in our case, the PhD student is like very vulnerable, because she or he is basically at the end of the chain on the lower level. […] The supervisor is actually someone that the student is very dependent on.*'

The principle of *developing community* emerged when the groups discussed rules, and rights and responsibilities of stakeholders, also while providing possible courses of action and using different ethical approaches. For instance, in Group 2 ECR 1 indicated the stakeholders and how the community could be influenced by the situation:

Fig. 3 Display of REI principles by groups
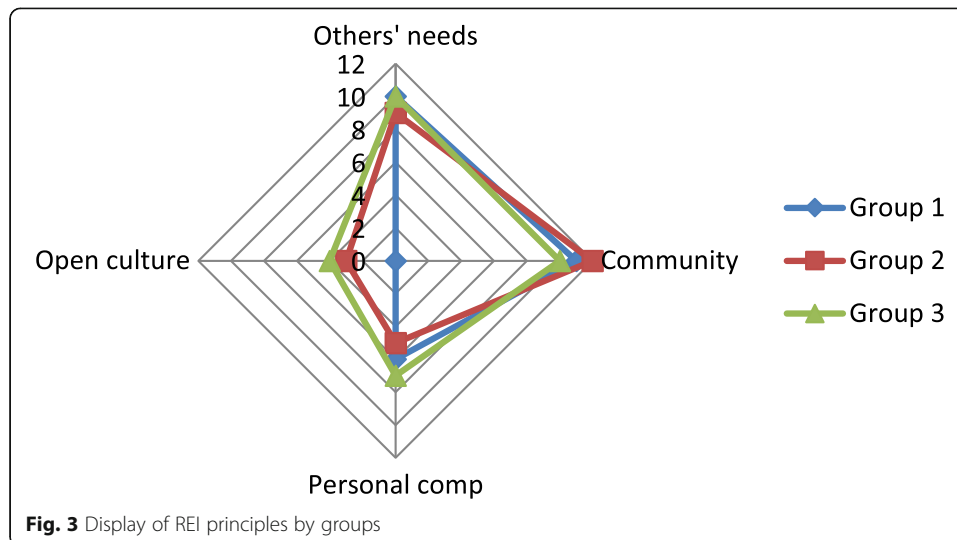
'And I was thinking that there are two different kinds of levels in the stakeholders, okay, we have the main actors that, somehow, we have the supervisor and the student, but we also have the responsible ones, that there could be the leader, plus the ethics committee if the institution gets very wrong. [...] But then there are some people that are affected. Because if there is tension between the supervisor and the supervisee, the colleagues in the team will feel very weird, not nice atmosphere.'

The principle of *developing personal competencies* was considered when the leader's role was taken and noticing themselves as stakeholders, also while considering their rights and responsibilities and providing courses of action, as indicated by the participant with leadership experience in Group 1.

'And then [..] there will have to be some kind of negotiation in the sense that it's not like the leader will propose - this is what we will do. It is more [...] what we are thinking of proposing and going to the student again to find [...] this mediation, kind of seeing if both sides are able to agree on the path of actions.'

Often the principle took the form of noticing the lack of competencies they would need, for example, the participant with leadership experience in Group 1 pointed out: '*I don't know, I will have to check*'.

The principle of enhancing *open culture* often emerged during discussing the virtue-based ethical approach, but it was also displayed while considering stakeholders. ECR 1 in Group 3 said:

'The type of leader that we are really influences the behaviour of our collaborators. So I will suggest to really try to be the trustful leader. [...] We have built such a type of relationship, that we can be transparent, and that we can actually approach each other in a very collaborative way and saying: what do we like? What do we need, what we don't have? It's easier to get people involved. Just communicate the problems, I think that communication has a really key role.'

While scrutinising who displayed REI leadership principles, it became evident that in 2 groups the participant with leadership experience displayed leadership principles (12 and 18 times) more often than the less experienced ones (see Table 5). In only one group, ECR 1 displayed more REI principles (17 times) than the participant with

Table 5 Heat map of displaying REI principles

	Group 1	Group 2	Group 3
Participant with leadership experience	12	18	10
ECR 1	6	8	17
ECR 2	2	3	4

leadership experience (who displayed it on 10 occasions). Usually, ECRs displayed leadership principles between 2 and 8 times.

Discussion

The current study focused on providing insights on one possible way to facilitate REI training for ECRs, but also academics, in HE context. In order to provide effective training to budding researchers and academics, it is important to understand the nature of their learning processes. This understanding will help facilitators scaffold training sessions to develop not only research ethics and integrity competencies, but also REI leadership competencies. The results of the study confirm that collaborative case-based role-play format is effective for teaching such competencies.

To begin with, to evaluate the learning process, evidence is needed on the process and outcomes, such evidence is provided by epistemic objects (Scardamalia and Bereiter 2006) that can come in written form (like group reports) as well as group discussion (like recordings). According to the analysis, the written group reports provided quite limited information about the levels of understanding, while group discussion analysis indicated much higher levels of understanding. This has also been monitored in previous studies with more expert learners (Tammeleht et al. in press). Nevertheless, previous research indicates (Hakkarainen 2009) that a shared written epistemic object supports collaboration, especially in online environments – it provides structure, helps maintain goal orientation and keeps focus. Achieving agreements on what to write down improves knowledge building (Scardamalia and Bereiter 2006) and obtaining metacognitive strategies (Lai 2011). Results also indicate that maintaining the goal and keeping focus were the most important scaffolding techniques needed for this target group. Thus, to evaluate the levels of understanding both the written and the oral part (group discussion) should be included.

In terms of the learning process, the participants exhibited multistructural (2) and relational (3) levels of understanding most of the time during the training sessions, but all groups reached extended abstract (4) level by the end of the session. 'Extended abstract' level on the SOLO taxonomy indicates that the learners can synthesise different ethical aspects into a coherent whole, generalise the conclusions and make them

applicable in other contexts. The focus of knowledge building is that the groups' understanding emerges (Scardamalia and Bereiter 2006) – by combining pieces of information and conclusions, the groups compile a more complex concept of their own. This was seen when the groups reached relational or extended abstract levels of understanding by the end of their training session. Scardamalia and Bereiter (2006) also emphasise that the focus of learning should be synthesising ideas to come up with ideas that are 'more' than before. In addition, as indicated in Fig. 2 and prior research (Authors in press), when groups followed the order of tasks and devoted sufficient time on discussing a topic, higher level of understanding was displayed. This can be related to the expert strategies for solving ethical dilemmas (Löfström et al. 2019) - with simple cases the experts start with the ethical issue and then move on to solutions, occasionally checking stakeholders and guidelines. While with complex cases, after discussing ethical issues the experts discuss stakeholders and guidelines, and only then provide a solution. The cases in the REI training of Leadership Level were rather complex, so the second strategy seems to be more appropriate which also makes following the ethical analysis steps important.

Subsequently, scaffolding analysis revealed that even though groups may require various amounts of scaffolding, the nature of scaffolding is quite similar. Even though the group report provides structural scaffolding (by providing the order to tasks, questions, highlighting critical features), depending on the group dynamics, additional scaffolding may be required. The groups mostly needed goal orientation, redirecting the learners and highlighting critical features – these techniques pertain to managing the leaning process or helping with articulation and reflection. Occasionally, asking questions and executing parts of the task were needed. Previous studies (Raes et al. 2012; Tammeleht et al. 2020) also support this outcome and state that more advanced learners can cope well with support included in the task design and are ready to get less oral scaffolding (so scaffolding fades). Still, sometimes support may be needed with sense-making (Tammeleht et al. 2020). This indicates that some additional structural scaffolds could be included in the task design, especially pertaining to including all group members, moderating the discussion in the order the questions are provided, and providing peer support. Monitoring the *facilitator talking time* revealed that the actual need for scaffolding was actually relatively little (between 11 and 16% of the total talking time), and the training format is student-led and learner-centred, which have proven to be effective in ethics education (Stoesz and Yudintseva 2018). Even though the 'talking time' concept is mostly related to ESL learning, where the 70% student talking-time-30% teacher talking-time rule should be strived for (Kostadinovska-Stojchevska and Popovikj 2019), there are indications that with more advanced learners the facilitator talking time could be even around 10%.

In addition, scrutinising collaboration revealed interesting patterns. The groups for the current study were compiled purposefully to include one participant with leadership experience and others ECRs. This way the ZPD could be provided to less experienced participants while at the same time helping more experienced researchers see other perspectives. Providing mutual training sessions would be an excellent opportunity to start building the culture of integrity in the organisation. ECRs and other academics benefit from sharing the same cases and materials as it offers opportunities to form mutual understanding of expectations, which is

especially important to cater for more sustainable supervisory relationships (Veh-viläinen and Löfström 2016; Löfström and Pyhältö 2017) as well as bringing up the next generation of REI leaders. Still, care should be taken not to force participants into groups that they do not feel comfortable about, e.g. due to a power imbalance.

Collaboration analysis showed that while the most experienced leader did not necessarily obtain the 'leader's position' in the group, data indicated that they displayed REI leadership competencies more, thus providing other group members with opportunities to learn from them. They also communicated with all group members, thus exhibiting their leadership competencies. Nevertheless, data also indicated that when the participant with leadership experience took a more accentuated role, scaffolding from the facilitator was mostly not needed. In addition, participants in that group said that the leader revealed aspects they had not considered themselves and the level of group understanding was high (relational level mostly) throughout the session.

Considering how REI leadership principles were displayed, it can be said that the training enabled the development of REI leadership competencies. Jordan et al. (2013) have previously emphasised the need to utilise a similar format of case-based group discussions for leaders to develop their ethical leadership competencies. All groups took the role of leaders and leadership principles were displayed. Different sections of the training provided opportunities for that (e.g. considering various stakeholders provided opportunities to think about developing the community by providing training and sharing best practices). Still, as developing personal competencies and focusing on open culture were not displayed that often, some additions to the training could be considered. For example, by adding guiding remarks to the questions about stakeholders (while identifying themselves as stakeholders, consider their personal competencies and recognise personal development needs), and enhancing open culture.

Conclusion

The current study sheds light on one way to approach developing research ethics and integrity competencies. The learning process, scaffolding patterns, collaboration and REI leadership development was scrutinised to gain new knowledge of how people can learn about research ethics and integrity in HE context.

All participating groups displayed high levels of understanding and were able to develop REI leadership competencies relevant for HE context. The nature of scaffolding needed on this level is mostly for goal orientation, highlighting critical features and redirecting the focus. Based on the results, we summarise principles for facilitating development of REI leadership competencies as follows:

- Collaborative case-based role-play format is suitable for training more expert learners as this format is learner-led and -centred.
- Scaffolding should support process management, and articulation and reflection (goal orientation, highlighting and redirecting), but also sense-making if necessary by asking leading questions.
- It is important to follow the order of ethical analysis and devote sufficient time on discussing the topics – this will ensure deeper understanding of the topic.

- The epistemic object should comprise a written and oral part – the written object will provide structural scaffolding and oral discussion will help with knowledge building and metacognitive skills.
- To support development of future generation of researchers it might be beneficial to combine ECRs and more experienced academics (including leaders) to work in the same group - this provides an opportunity for everyone to see different perspectives, build trust and culture of integrity.
- Care should be taken not to force people into groups that may cause discomfort for them.

As the results come from a limited number of REI leadership training sessions, and data were collected among one research team, more testing in different universities is needed. Moreover, future studies could track the learners using the same training format (with different cases provided to participants) several times and monitor their competence development over time. It may be worthwhile to explore whether there are gender differences in the way participants respond to training. In addition, self-reflection data from learners could be collected in the future to triangulate the achieved learning outcomes. The developed instruments could be used in other studies in research ethics and integrity context to evaluate both the understanding, scaffolding patterns and development of leadership competencies.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s40979-022-00102-3.

Additional file 1. Appendix: SOLO taxonomy interpretation. Fig. 4. Screenshot of the SOLO taxonomy interpretation.

Availability of data and materials
Data collected with the *CoTrack* device has been included in the article. The e-portfolios and groups discussion recordings are not shared due to a small sample and limited context. Nevertheless, excerpts from raw data are provided as illustration.

Declarations

Competing interests
The authors declare no competing interests.

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