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The factor structure of the peer-feedback orientation scale (PFOS): toward a measure for assessing students' peer-feedback dispositions

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ABSTRACT

This study reports on the quantitative findings of an exploratory sequential mixed methods study in which the underlying factor structure of students' peer-feedback orientation (i.e. openness to provide and receive peer-feedback) was investigated. Building on the qualitative findings of a previous study in which the 'peer-feedback orientation' concept was introduced, an online survey was developed to collect data among higher education students ($N=148$). An exploratory factor analysis produced a five-factor solution including the dimensions: accountability, communicativeness, utility, self-efficacy and receptivity. The practical value of the results lies in having a measure of students' peer-feedback orientation that provides teachers and researchers with an instrument for understanding students' dispositions toward receiving and providing peer-feedback.

KEYWORDS

Peer-feedback;
peer-feedback
orientation;
Peer-Feedback
Orientation Scale;
scalability

Introduction

Feedback can be a catalyst for growth provided that the communication between provider and receiver is clear, constructive and put into practice. In peer-feedback, students are reviewing (formative) or assessing (summative) each other's work. Learning from and with each other enables students to reflect on their own work and compare it with their peers (Race 2014). Next to the educational value and relevance of transversal skill including collaboration, critical thinking and social skills, peer-feedback has the potential to unburden the teacher and enable student interaction in a scalable way (Wanner and Palmer 2018).

In this study we use the term peer-feedback for the formative feedback that students provide and receive with the purpose of learning (Huisman et al. 2020). Students learn from both providing as well as receiving feedback (Nicol, Thomson, and Breslin 2014; Wanner and Palmer 2018). Both roles come with different tasks and responsibilities of which the execution is influenced by individual differences regarding students' beliefs, perceptions, emotions and domain knowledge (Alqassab, Strijbos, and Ufer 2019). Acting upon received feedback, reflecting and revising previous work remains more often theory than practice (Mulliner and Tucker 2017). This is a concern because student engagement and the awareness of being responsible for

their own learning and improvement is needed in order for feedback to be effective (Boud and Molloy 2013). Furthermore, being open towards receiving and providing feedback is beneficial as it is seen as a basic workplace competence (Carless and Boud 2018; Huisman et al. 2020).

Many studies (Gielen et al. 2010; Nguyen, Xiong, and Litman 2017; Carless and Boud 2018; Dickson, Harvey, and Blackwood 2019; Elizondo-Garcia, Schunn, and Gallardo 2019) focus on the educational design of peer-feedback activities. However, hitherto, limited attention has been given to the needs and beliefs of students with regard to peer-feedback (Srichanyachon 2012; Mulliner and Tucker 2017; Dawson et al. 2019). Building on this line of thought, this study focuses on the individual student in a peer-feedback process and, in particular, their openness towards it. The goal of this study is to: (1) investigate the relation of individual student factors that influence their openness to provide and receive peer-feedback (i.e. peer-feedback orientation), and (2) to support future research in validating a peer-feedback orientation scale. Teachers can find practical value in this study by using the underlying key factors as reference points when instructing and supporting students before and during peer-feedback. Previously mentioned issues around peer-feedback such as acting upon peer-feedback, being open to provide and receive it and being aware of the various tasks and responsibilities that come with the different feedback roles can be addressed by teachers. The results can be used during reflection reports or progress meetings in which students reflect on and discuss their openness, perceptions and behaviour.

Elements that are not directly related to the student but find their origin in the feedback environment (e.g. feedback culture, feedback instructions, domain, task environment) in which peer-feedback takes place are recognised as important, yet are not considered in this particular study.

A limited number of recent studies provide insights into student related elements that influence feedback behaviour. In a study by Carless and Boud (2018) low levels of feedback literacy are seen as one of the main barriers to effective feedback. Feedback literacy is described as the capability to appreciate feedback, make judgments and manage affect, in order to take action. Lacking a sufficiently high level of feedback literacy makes it difficult to act upon the received feedback. To date, little is known about student elements that can play a role in students' openness to peer-feedback. As pointed out by Alqassab, Strijbos, and Ufer (2019), research about beliefs and perceptions of feedback has mainly focussed on the feedback receiver which is why we know less about the feedback provider (Winstone et al. 2017). Huisman et al. (2020) argue that there are four themes of student's beliefs which are: (1) valuation of peer-feedback as an instructional method, (2) confidence in own peer-feedback quality, (3) confidence in quality of received peer-feedback and (4) valuation of peer-feedback as an important skill.

Feedback orientation

When looking outside the educational literature to the field of performance management in a professional context, London and Smither (2002) proposed a concept called 'feedback orientation'. Feedback orientation is an 'individuals' overall receptivity to feedback, including comfort with feedback, tendency to seek and process it mindfully, and the likelihood of acting on the feedback to guide behaviour change and performance improvement' (p. 81). Based on their work, Linderbaum and Levy (2010) proposed a 'Feedback Orientation Scale' (FOS) to get insight into the feedback orientation of employees in a work-related setting. They focus on employees' openness to receive, seek and use feedback in the context of self-development. According to the authors, the feedback orientation of the receiver is crucial for the effectiveness of feedback. Within the perspective of the receiver, they propose four related dimensions with which individual differences can be investigated: utility, accountability, social awareness and self-efficacy (see Table 1 right column). The 'peer-feedback orientation' scale by Linderbaum and Levy (2010) is among other scales the base for this study.

Table 1. Dimensions of the ‘Feedback Orientation Scale’ by Linderbaum and Levy (2010).

Dimension	
Utility:	An individual’s tendency to believe that feedback is instrumental in achieving goals or obtaining desired outcomes at work.
Accountability:	An individual’s tendency to feel a sense of obligation to act on feedback.
Social awareness:	An individual’s tendency to use feedback to be aware of other’s views of oneself and to be sensitive to these views.
Self-efficacy:	An individual’s tendency to have confidence in dealing with feedback situations and feedback.

The relevance of the FOS dimensions (Table 1) in the context of (peer-)feedback is supported by recent literature. Aspects of the utility dimension are mentioned in studies about students’ low feedback literacy (Carless and Boud 2018). Likewise, students’ beliefs and perceptions about the educational value of feedback are seen as important factors that influence learning behaviour, engagement and self-regulation (Hulleman et al. 2008; Boud and Molloy 2013; Patchan and Schunn 2015; Alqassab, Strijbos, and Ufer 2019). Seeing value (utility) in peer-feedback influences feelings of obligation (accountability). In peer-feedback students get an active role; however, the extent to which students will feel obligated to act on feedback is related to the perceived value of it (Alqassab, Strijbos, and Ufer 2019). The social context can be influenced by the setting in which peer-feedback takes place and the relationships students have with each other and their teachers (Carless and Boud 2018). However, not only the relationship with peers but also students’ beliefs about themselves and their own confidence in dealing with feedback (self-efficacy) are playing a role (Alqassab, Strijbos, and Ufer 2019; Huisman et al. 2020).

Feedback orientation scales

Linderbaum and Levy (2010) FOS was further validated and implemented in different contexts such as leadership development (Braddy et al. 2013), emotional intelligence and feedback environment perceptions (Dahling, Chau, and O’Malley 2012). Moreover, scales such as the ‘Feedback Environment Scale’ (Steelman, Levy, and Snell 2004) and the ‘Instructional Feedback Orientation Scale’ (IFOS) (King, Schrodtt, and Weisel 2009) were introduced. The latter focussed on college students’ dispositions/orientations towards receiving teachers’ corrective feedback and the individual differences in processing it. They found four dimensions to be relevant: utility, sensitivity, confidentiality and retention (King, Schrodtt, and Weisel 2009). However, with the exception of the ‘utility’ dimension (which is interpreted differently in the FOS), the IFOS (King, Schrodtt, and Weisel 2009) includes a different set of dimensions. With the FOS, Linderbaum and Levy (2010) investigated employees’ feedback orientation in a work environment setting where feedback is seen as an important tool to be used by employers to support employees’ professional development. This suggests that the context in which an individual’s feedback orientation is studied may involve different factors.

It is expected that a scale about students’ peer-feedback orientation differs from existing scales on feedback orientation (King, Schrodtt, and Weisel 2009; Linderbaum and Levy 2010). Whereas the FOS (Linderbaum and Levy 2010) focuses on the feedback orientation of employees in an organisational context, the IFOS (King, Schrodtt, and Weisel 2009) focuses on students’ feedback orientation regarding corrective teacher feedback. The differences between these scales relate to: (1) the setting in which feedback is provided and received, (2) the parties involved, and (3) the function of feedback.

Peer-Feedback orientation scale

This study adds a new perspective by investigating individual factors that influence students' openness to provide as well as receive (i.e. peer-feedback orientation). While feedback orientation is studied in different contexts, it remains unclear, yet relevant, how it can be translated to students in a peer-feedback context. Providing and receiving peer-feedback implies a certain degree of openness. Students with a low peer-feedback orientation and thus low levels of openness to provide and/or receive peer-feedback are expected to have different perspectives, motivations and needs than students with a high peer-feedback orientation.

Qualitative findings of our study on students' peer-feedback orientation showed some previously unreported elements and a new interpretation that varied from the original dimensions of the FOS (Kasch, van Rosmalen and Kalz 2020). These findings support our hypothesis that existing scales (FOS and IFOS) do not fully fit in a peer-feedback context and that a peer-feedback orientation scale is of added value.

Investigation of underlying factors of students' peer-feedback orientation may benefit researchers, teachers and students. Awareness of these factors in an educational setting will enable teachers to provide safe and rich student interaction by addressing students' needs, expectations and behaviours. A peer-feedback orientation scale can supplement existing instructions about peer-feedback by communicating social factors, roles and expectations to students.

Therefore, the research question of this study is: which factor structure is suitable to investigate students' peer-feedback orientation?

The current study is contributing to and expanding on the current state-of-the-art about feedback orientation with regard to the following three aspects:

1. **Receive and provide:** Compared to the original FOS (Linderbaum and Levy 2010) and the related IFOS (King, Schrod, and Weisel 2009), where both cases focussed on the receiver's feedback orientation, our study focuses both on receiving and providing feedback. Providing and receiving feedback requires different tasks and responsibilities and it is expected that the openness to provide does not necessarily equal an individual's openness to receive feedback (Alqassab, Strijbos, and Ufer 2019).
2. **Among students:** Peer-feedback in an educational context is fundamentally different than receiving feedback at work from colleagues and managers or from a teacher. Differences are expected in the way feedback is facilitated, its consequences and the hierarchy between the provide and receiver. Additionally, the provider will (should) always receive peer-feedback on a related task which implies interaction and interdependency between both parties.
3. **Formative feedback:** While the IFOS (King, Schrod, and Weisel 2009) focussed on corrective feedback, this study focuses solely on formative peer-feedback. Formative feedback has a supporting (rather than assessing) character that is provided during the learning process.

Method

Research design

An exploratory sequential mixed methods research design (Creswell et al. 2008) was used to investigate factors influencing students' peer-feedback orientation (Figure 1). Qualitative findings from our previous study on students' peer-feedback orientation (Kasch, van Rosmalen and Kalz 2020) were used as a basis for the quantitative data collection and analysis described in this paper. Quantitative data was collected through an online survey on peer-feedback orientation and analysed via an exploratory factor analysis (EFA).

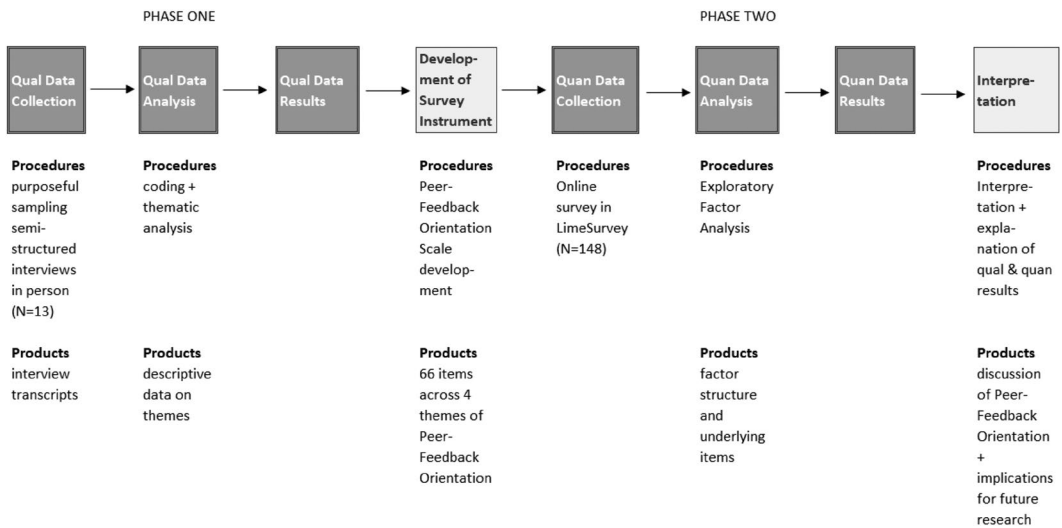


Figure 1. Sequential Exploratory Design applied for this study adapted from Berman (2017).

Materials

For the data collection, an online survey was developed following the questionnaire development guidelines of Brancato et al. (2006) which include the stages of conceptualisation, questionnaire design, questionnaire testing, revision and data collection. The conceptualisation stage took place in our previous study where semi-structured interviews were held regarding the four feedback orientation dimensions (Linderbaum and Levy 2010) in the context of peer-feedback (Kasch, van Rosmalen and Kalz 2020). This resulted in 562 codes which were clustered into fifteen meaningful subthemes related to the four feedback orientation dimensions. During the questionnaire design stage, the 562 codes were used to write an initial set of survey items ($N=276$). These items were then tested and reviewed. After a first review round by three researchers, redundant and ambiguous items were eliminated, resulting in a second set of 66 items. Next, this second set of items was carefully examined for face validity by two researchers. The language (Dutch), wording and subthemes addressed by the participants in the semi-structured interviews formed the foundation for the item writing process (Kasch, van Rosmalen and Kalz 2020). Additionally, the original 'Feedback Orientation Scale' (FOS) and its items ($N=25$) were used as an overall frame of reference (Linderbaum and Levy 2010). In the end, the survey included 66 items (seven items negatively worded) regarding students' peer-feedback orientation covering four dimensions: feedback utility ($N=15$), accountability ($N=16$), social awareness ($N=17$) and self-efficacy ($N=18$). In order to investigate factors that influence students' peer-feedback orientation, a distinction was made between elements that play a role for the receiver and elements that play a role for the provider. Each factor contained the same number of elements regarding the receiver as well as the provider.

Additionally, 10 items were included for the demographic data and peer-feedback experiences of the participants. Like the original 'FOS' by Linderbaum and Levy (2010), a 5-point Likert-type scale was used. Some assurance for content validity was provided by including (almost) equal number of items across the four dimensions (utility, accountability, social awareness, self-efficacy).

Data collection and analysis

The online survey was administered to higher education students in the Netherlands to explore underlying factors of students' peer-feedback orientation. Students were contacted (upon

Table 2. Demographics of participants quantitative data collection ($N=148$).

Demographics	N	%
<i>Gender</i>		
Female	109	74
Male	35	24
N/A/other	4	2
<i>Age</i>		
<25	53	36
25-34	37	25
>35	58	40
<i>Higher Education Institute</i>		
Open University of the Netherlands	50	34
Zuyd University of Applied Sciences	44	30
Utrecht University	28	19
Fontys University of Applied Sciences	22	15
Other	4	3
<i>Study</i>		
Education	67	45
Physical Therapy	21	14
Healthcare	18	12
Psychometrics	20	14
Psychology	12	8
Other	10	7

approval of their teacher) to fill in the online survey. Additionally, students were recruited online via the website of our research project. The ethical commission of our university approved this study and participation in the study was based on informed consent. The survey was distributed using the LimeSurvey software, which allowed online data collection. To include students from a wide variety of higher education institutions we drew our sample from one university, one open university and two universities of applied sciences in the Netherlands. In these institutions, participants came from five different study programs (see [Table 2](#)).

To encourage participation, the first 150 students who completed the survey had a chance to win a gift voucher. The survey was online from October 2019 through December 2019. After that period the collected data was downloaded from LimeSurvey and analysed in SPSS version 25 and R 3.5.1 with RStudio 1.2.5033 and the psych package (Revelle [2015](#)). A total of 170 students filled in the survey, 148 of them completely (see [Table 2](#)). According to recommendations by Worthington and Whittaker ([2006](#), p. 817) 'sample sizes of 150 to 200 are likely to be adequate for with data sets containing communalities higher than .50'. All participants gave consent to voluntarily participate and had experience with peer-feedback.

Results

Factor structure of the Peer-Feedback orientation scale (PFOS)

A normality assessment of the data ($N=148$) was conducted following recommendations by Mecklin and Mundfrom ([2005](#)) with Royston's ([1995](#)) multivariate extension to the Shapiro-Wilk test. Results show that the data do not follow a normal distribution. Since our primary research goal is to explore the relationship and factor structure of the items, violations to normal distribution do not restrict factor analysis ([Tabachnick and Fidell 2014](#)).

An initial reliability assessment of the data via the measure of sampling adequacy (MSA) (Hair et al. [2014](#)) for the 66 items has resulted in removal of 18 items with a low KMO value ($<.6$). An initial Bartlett's Test of Sphericity confirmed factorability of the data. Two methods have been combined to assess the number of factors to retain. A scree plot (Cattell [1966](#))

suggested a 5-factor solution which has been confirmed by parallel analysis (Hayton, Allen, and Scarpello 2004). Since principal axis factoring (PAF) does not rely on a particular distribution and is less prone to invalid factors solutions compared to maximum likelihood estimation, it was decided to apply principal axis factoring for an initial factor analysis of the data. Since some correlation between factors was expected, a promax rotation method was used. In total six rounds of analysis have been conducted in which items have been stepwise deleted due to either cross-loadings or no loadings to any of the factors. Following the recommendations by Tabachnick and Fidell (2014), a cut-off value of .32 was set to retain items.

The final analysis has been conducted with 22 out of the 66 items (Table 3). Suitability testing of the final data for factor analysis was assessed using the Kaiser-Meyer-Olkin measure which showed a value of .8 which is regarded as a very good indicator for sampling adequacy (Kaiser 1970; 1974). The factorability of the data was also supported by the strongly significant ($p < .001$) Bartlett's Test of Sphericity confirming that the correlation matrix was not random. The goal for the final factor analysis was to reach 'simple structure' which is regarded as a factor structure in which several variables are highly correlated with each factor and each variable only correlates highly with one factor (Tabachnick and Fidell 2014). Finally, a principal axis exploratory factor analysis with a cut-off point of .32 and promax rotation yielded a five-factor solution as the best fit for the data, accounting for 43% of the variance. The 22 remaining items had no cross-loadings and all items loaded on one factor only (Table 4 and 5).

Table 3. Peer-Feedback Orientation Scale (PFOS).

Five point likert scale (totally agree – agree- neutral – disagree – totally disagree)

Accountability

1. As a peer-feedback provider, I feel responsible to give feedback that helps the other person.
2. As a peer-feedback provider, I feel responsible for the peer-feedback I give.
3. As a peer-feedback receiver, I always take in all the feedback I receive to see if it's of any use to me.
4. As a peer-feedback provider, I want that the other person benefits from my feedback.
5. As a peer-feedback provider, I give feedback in such a way that I would be happy to receive it myself.

Communicativeness

1. As a peer-feedback provider, I give feedback more objectively when I don't know the receiver.
2. As a peer-feedback receiver, it makes me insecure when I get feedback from someone who is very good.
3. As a peer-feedback provider, I do my best when I get a grade for giving feedback.
4. There must be a balance between positive and negative feedback.
5. As a peer-feedback provider, I am more inclined to give feedback when I hear that people appreciate my feedback.

Utility

1. As a peer-feedback receiver, I accept peer-feedback sooner if it is substantiated.
2. As a peer-feedback receiver, peer-feedback becomes more useful when I can discuss it.
3. As a peer-feedback receiver, I want to know from whom I have received feedback so that I can start the conversation if I didn't understand something.

Self-Efficacy

1. As a peer-feedback provider, I have confidence in the peer-feedback process, i.e. I know how to comment and how my comments are reviewed.
2. As a peer-feedback provider, I feel that we as students have enough content knowledge to be able to give each other feedback.
3. I know how to make the most of peer feedback.
4. As a peer-feedback provider, I know how to give peer-feedback.
5. A good and safe atmosphere in the group positively influences the peer-feedback process.

Receptivity

1. As a peer-feedback receiver, I think that even if someone else has a different point of view, there may still be something valuable in it.
2. As a peer-feedback receiver, I accept feedback from everyone, regardless of whether I can get along with the person or not.
3. As a peer-feedback receiver, I am open to different points of view and know that there is not always one correct answer.
4. As a peer-feedback receiver, I am able to process both positive and negative peer-feedback.

Table 4. Summary of Exploratory Factor Analysis Results for Peer-Feedback Orientation Scale for Higher Education using Maximum Likelihood Estimation ($N=148$).

		5 Factor solution				
	PFOS items	1	2	3	4	5
1	As a peer-feedback giver I feel responsible to give feedback that helps the other person.	0.91	0.03	-0.02	-0.05	-0.06
2	As a peer-feedback giver I feel responsible for the peer-feedback I give.	0.84	0.00	-0.08	-0.02	0.10
3	As a peer-feedback receiver, I always take in all the feedback I receive to see if it's of any use to me.	0.47	0.03	0.05	0.21	0.02
4	As a peer-feedback giver I want that the other person benefits from my feedback.	0.46	-0.04	0.20	0.13	-0.11
5	As a peer-feedback provider I give feedback in such a way that I would be happy to receive it myself.	0.36	0.03	0.18	0.01	0.23
6	As a peer-feedback provider I give feedback more objectively when I don't know the receiver.	0.00	0.71	-0.01	-0.16	-0.01
7	As a peer-feedback receiver it makes me insecure when I get feedback from someone who is very good.	-0.09	0.55	0.01	-0.05	0.06
8	As a peer-feedback provider I do my best when I get a grade for giving feedback.	0.10	0.50	-0.06	-0.13	-0.13
9	There must be a balance between positive and negative feedback.	0.19	0.50	-0.14	0.13	0.01
10	As a peer-feedback provider I am more inclined to give feedback when I hear that people appreciate my feedback.	-0.29	0.37	0.30	0.15	0.09
11	As a peer-feedback receiver I accept peer-feedback sooner if it is substantiated.	0.01	-0.05	0.86	-0.22	-0.08
12	As a peer-feedback receiver, peer-feedback becomes more useful when I can discuss it.	0.06	-0.06	0.79	0.00	-0.13
13	As a peer-feedback receiver I want to know from whom I have received feedback so that I can start the conversation if I didn't understand something.	0.09	-0.07	0.47	0.11	0.06
14	As a peer-feedback provider I have confidence in the peer-feedback process, i.e. I know how to comment and how my comments are reviewed.	0.09	-0.04	-0.19	0.95	-0.15
15	As a peer-feedback provider, I feel that we as students have enough content knowledge to be able to give each other feedback.	-0.09	0.03	-0.07	0.67	0.02
16	I know how to make the most of peer feedback.	-0.02	-0.13	-0.05	0.54	0.10
17	As a peer-feedback provider, I know how to give peer-feedback.	0.09	-0.12	0.08	0.45	-0.08
18	A good and safe atmosphere in the group positively influences the peer-feedback process.	0.01	0.28	0.16	0.35	0.02
19	As a peer-feedback receiver, I think that even if someone else has a different point of view, there may still be something valuable in it.	-0.09	0.00	0.12	-0.08	0.80
20	As a peer-feedback receiver, I accept feedback from everyone, regardless of whether I can get along with the person or not.	-0.01	0.02	-0.21	0.00	0.63
21	As a peer-feedback receiver I am open to different points of view and know that there is not always one correct answer.	0.10	-0.11	0.05	0.02	0.58
22	As a peer-feedback receiver I am able to process both positive and negative peer-feedback.	0.15	0.04	-0.02	-0.06	0.54

Table 5. Total variance of each factor.

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3.14	11	11
2	1.94	9	20
3	1.76	8	28
4	1.78	8	36
5	1.63	7	43

Reliability of the PFOS

The internal consistency of the five factors was assessed through Cronbach's alpha (Taber 2018). Table 6 shows that the Cronbach's alpha for almost all five factors meet an acceptable internal consistency value of $>.70$. Only items of factor five had a mediocre internal reliability.

The EFA indicated that students' peer-feedback experience can be mapped by 22 items which are best distributed among five components/factors (see Table 6). Correlations between the factors are presented in Table 7. Factor labels were defined that fitted the extracted factor/items-combinations and are defined as follows:

- Accountability (factor 1): students' sense of responsibility for their own learning process and that of a fellow peer.
- Communicativeness (factor 2): students being inclined to provide and receive peer-feedback under certain circumstances.
- Utility (factor 3): the personal added value students perceive for their learning process by engaging in peer-feedback.
- Self-efficacy (factor 4): students' confidence in their knowledge and skills to provide valuable peer-feedback.
- Receptivity (factor 5): students' receptiveness towards peer-feedback.

Discussion

Prior studies have noted the importance and influence of individual differences when it comes to receiving feedback (London and Smither 2002; King, Schrodtt, and Weisel 2009; Linderbaum and Levy 2010). We explored factors that are suitable to investigate students' openness to provide and receive peer-feedback (i.e. peer-feedback orientation). The current study was based on two previous studies: (1) the Feedback Orientation Scale (FOS) by Linderbaum and Levy (2010) who provided a four factor structure and (2) a qualitative study where we investigated which elements play a role in students' peer-feedback orientation and if/how these elements can be mapped by the FOS (Kasch, van Rosmalen and Kalz 2020).

Through exploratory factor analysis we found five factors that influence students' peer-feedback orientation: accountability, communicativeness, utility, self-efficacy and receptivity. The standardised factor loadings were between .35 and .91 indicating high quality loadings and thus high internal consistency per factor (see Table 4, 5 & 6).

The factor structure of this preliminary scale shows that overall the five factors have a moderate correlation (see Table 7). This is in line with our expectations given the rotation method that was chosen for the EFA. This is also partly in line with the study by Linderbaum and Levy (2010) who found that the four factors of their FOS are highly correlated. Surprisingly, we found that only four of the five factors do (moderately) correlate with each other whilst one factor

Table 6. Factor labels, number of items and internal consistency value per factor.

	# items	label	α
Factor 1	5	Accountability	.80
Factor 2	5	Communicativeness	.70
Factor 3	3	Utility	.70
Factor 4	5	Self-Efficacy	.72
Factor 5	4	Receptivity	.64

Table 7. Correlation matrix between factors of the PFOS factor structure.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1	0.04	0.41	0.50	0.56
Factor 2	0.04	1	0.25	0.08	−0.01
Factor 3	0.41	0.25	1	0.53	0.53
Factor 4	0.50	0.08	0.53	1	0.56
Factor 5	0.56	−0.01	0.53	0.56	1

(communicativeness) emerged as an independent factor. As a result we see a factor structure of four factors which are correlated and one independent factor. The factor model has reached simple structure (Thurstone 1947). Simple structure is given when several variables are highly correlated with each factor and each variable only correlates highly with one factor. Each factor contains several variables with excellent, very good or good loadings (Comrey and Lee 2013). Moderate correlations were found between students' accountability (factor 1) and self-efficacy (factor 4) and students' accountability (factor 1) and the perceived utility (factor 3). Students' receptivity (factor 5) correlates with their perceived utility (factor 3) and receptivity (factor 5) with students' self-efficacy (factor 4). The moderate correlation between these four factors shows that they are related, yet distinct aspects of students' peer-feedback orientation. Students' communicativeness (factor 2) was not correlated with any other factor which was surprising. A possible explanation could be that this factor is highly connected to the overall concept of peer-feedback orientation which can be defined as students' openness to provide as well as receive peer-feedback.

The study by Kasch, van Rosmalen and Kalz (2020) indicated that the four FOS factors (utility, accountability, social awareness, self-efficacy) are relevant for students' peer-feedback orientation. However, the qualitative findings also showed that the factors had a different meaning when translated from a work environment context (Linderbaum and Levy 2010) to an educational peer-feedback context (Kasch, van Rosmalen and Kalz 2020). When comparing the resulting factors with related studies (King, Schrodtt, and Weisel 2009; Linderbaum and Levy 2010) we see differences regarding the factors that are playing a role, the factor structure/order, the number of factors and their interpretation. Instead of four factors, we found that five factors are underlying peer-feedback orientation. Second, the meaning of some factors differs from previous studies. Third, the factors utility and receptiveness solely focus on the feedback receiver instead of both receiver and provider. These differences confirm our expectation that existing scales and their factors cannot be translated one-on-one to a peer-feedback context and that a 'Peer-Feedback Orientation Scale' (PFOS) is of added value. However, there are also similarities between the findings of this study, our previous qualitative study (Kasch, van Rosmalen and Kalz 2020) and the original FOS by Linderbaum and Levy (2010). The factors accountability, utility and self-efficacy play a role in feedback orientation as well as peer-feedback orientation.

In a peer-feedback context, the factor accountability is not simply about feeling responsible to act on the received feedback and use it, as proposed by Linderbaum and Levy (2010), but more about students feeling accountable for the feedback they provide, feeling responsible to help their peers and to accept the received feedback. This is in line with the qualitative results of our previous study (Kasch, van Rosmalen and Kalz 2020). In related literature accountability is seen as a vital factor that can influence the quality of peer-review/assessment (Patchan, Schunn, and Clark 2018). Students who feel accountable or are held accountable for the feedback they provide ought to provide qualitative better feedback. Through this factor we can investigate to what extent a student feels accountable to provide as well as receive peer-feedback.

Utility is a relevant factor both in a work as well as an educational peer-feedback context. However, compared to the findings of the qualitative study, this study showed that peer-feedback utility is not about the value/utility of peer-feedback but rather about the circumstances under which students perceive peer-feedback utility when being the feedback receiver. Looking at the underlying items for this factor a new interpretation emerged describing the utility of peer-feedback as enabling students to discuss the received peer-feedback; clarifying misunderstandings and receiving substantiated feedback are elements that influence the perceived utility. Related research supports the relevance of feedback utility and points out that students tend to not utilise the received feedback if they do not perceive it as useful (Jönsson 2013; Anker-Hansen and Andrée 2019). Similar to the FOS by Linderbaum and Levy (2010), peer-feedback utility is perceived from the feedback receivers' perspective only. The literature states that students learn both from providing as well as receiving peer-feedback (Nicol,

Thomson, and Breslin 2014) and, although being a legitimate claim, this seems not to be acknowledged by the students themselves. Students seem to focus more on getting value out of receiving than providing feedback showing that the focus is more on the outcome and personal benefit of receiving. This is somewhat contrary to the findings of Jönsson (2013) and Mulliner and Tucker (2017), who pointed out that students seldom use the feedback to improve their work.

Self-efficacy is also relevant both in work as well as an educational peer-feedback context. Similar to the findings of our qualitative study (Kasch, van Rosmalen and Kalz 2020) self-efficacy is about students' confidence in dealing with feedback their own knowledge, knowing how to use and provide and feeling safe to do so. The relevance of self-efficacy in peer-feedback is also supported by other studies that point out that students who lack strategies to deal with feedback might be less engaged in the process (Jönsson 2013; Alqassab et al. 2019; Carless and Boud 2018).

In contrast to earlier (peer-) feedback orientation studies (Linderbaum and Levy 2010; Kasch, van Rosmalen and Kalz 2020) the factors receptiveness and communicativeness are new. Social awareness got omitted as a relevant factor when investigating students' peer-feedback orientation. Communicativeness is about personal and social variables and conditions that influence the process of providing and receiving peer-feedback. The results show that social relationships and status of the peer influence how open students are to provide as well as receive. The possible influence of social status and friendships are also reflected in related research (Tsai, Lin, and Yuan 2002; Panadero, Romero, and Strijbos 2013). Receptivity is about elements that influence the feedback receivers' peer-feedback orientation when it comes to accepting and using feedback. Accepting different points of view, seeing value and being open to different perspectives are elements of this factor. The receptiveness to feedback lies at the core of feedback orientation. When the concept feedback orientation was proposed and discussed in a paper by London and Smither (2002) they described it as an 'individuals' overall receptivity to feedback, including comfort with feedback, tendency to seek feedback and process it mindfully, and the likelihood of acting on the feedback to guide behaviour change and performance improvement' (81). Based on the current findings it seems that peer-feedback orientation is more than a general receptiveness and rather a general openness to provide and receive peer-feedback.

Together with our previous qualitative study, this study appears to be the first to investigate students' peer-feedback orientation and the underlying factors influencing it. It lays the groundwork for future research and is the next step toward defining and validating a quantitative measure of students' peer-feedback orientation, called 'Peer-Feedback Orientation Scale' (PFOS) with which students' peer-feedback orientation can be investigated.

This study adds to existing peer-feedback orientation scales and proposes five factors (accountability, communicativeness, utility, self-efficacy and receptivity) and underlying items that can be used to investigate students' peer-feedback orientation. The findings can be of interest to teachers who already apply peer-feedback in their teaching practices. When implementing the PFOS teachers should be aware of any additional time investment required of them and their students (i.e. answering the items, discussing the results). It is suggested to apply the PFOS in a way that students experience its added value and support of the peer-feedback process.

There are several ways in which the PFOS could be applied in practice:

1. The PFOS could be used as a questionnaire to be filled in before a peer-feedback activity providing teachers with insight into their students' openness and perceptions regarding the five factors. That way teachers can tailor instructions and support to address students' perspectives and needs with the aim of increasing feedback uptake and general engagement. For example, if a vast majority of students score low on self-efficacy, the teacher can spend more time on providing students with the needed knowledge and skills.

2. Another option could be to use the PFOS before or during peer-feedback to let students reflect on their role as feedback provider and receiver. Student answers can be used as input for discussions about the importance and meaning of the factors. Based on the items, students can share their expectations and experience in order to create a meaningful peer-feedback experience.

According to London and Smither (2002) feedback orientation may change over longer periods of time (after 12 months) due to various feedback experiences, context and cultures which can shape an individual's feedback orientation. This implies that the direct impact of a PFOS might not be visible in cross-sectional research data. However, being aware about the different factors that can play a role during peer-feedback, and openly discussing and addressing them, opens the possibility to change and growth. It would be interesting to study the effect of peer-feedback instructions that incorporate the PFOS factors.

Future research should address limitations of this study by ensuring a higher item-participant ratio. Regarding the validity it would be interesting to repeat this study in another context, since the use and meaning of (peer-)feedback differs across cultures.

Disclosure statement

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