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Individual differences in self-reported use of assessment feedback: The mediating role of feedback beliefs

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Abstract

Feedback can rarely enhance learning unless it is used; however, few studies have examined individual differences in students' engagement with feedback. The present study explored a) the extent to which personality variables and achievement goal orientation are associated with students' self-reported use of feedback; and b) whether beliefs about feedback (utility, accountability, self-efficacy, and volition to implement feedback) mediate these associations. Students aged 16-18 (N = 746) completed self-report measures assessing each of these constructs. Self-reported feedback use was greater among students who scored high in mastery approach goals, performance approach goals, and conscientiousness. Controlling for academic achievement (which correlated weakly with self-reported feedback use), all of these associations were mediated by self-efficacy, and a subset of the associations were also mediated by the perceived utility of feedback and volition to implement feedback. Supporting students to feel competent in using feedback should be a key priority for interventions.

Keywords: Feedback, personality, achievement goal orientation, feedback orientation, further education

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Because of their central role in facilitating learning, feedback processes represent a core focus of educational practice and policy (e.g., Hattie & Timperley, 2007). Feedback on students' work may come from teachers, peers, or self-evaluation, and might identify strengths, errors, and guidance for future development, or strive to facilitate students' self-regulation. Despite the many benefits of receiving such feedback (Harks, Rakoczy, Hattie, Besser, & Klieme, 2014), feedback does not always facilitate learning (Kluger & DeNisi, 1996). For example, in particular circumstances feedback can threaten self-esteem or motivation (Fong, Patall, Vasquez, & Stautberg, 2019; Hepper & Sedikides, 2012), which can in turn affect performance. It is therefore increasingly argued that greater emphasis should be placed on how students receive and act upon feedback (Boud & Molloy, 2013), and how students' engagement with feedback mediates its effects on learning. Winstone, Nash, Parker, and Rowntree (2017a) highlight the crucial role of *proactive recipience:* "a state or activity of engaging actively with feedback, thus emphasizing the fundamental contribution and responsibility of the learner" (p.13). No matter how high the quality of written feedback, it cannot improve learning and skill development if students do not make sense of and act on it (Ajjawi & Boud, 2017; Boud & Molloy, 2013; Nash & Winstone, 2017; Winstone et al., 2017a). Indeed, there is evidence that the extent of students' engagement with feedback predicts their subsequent grade improvement (Zimbardi et al., 2017). Yet, little is known about which characteristics make a student more likely to engage in proactive recipience, or the mechanisms that underlie such individual differences. In the present study, we explore individual dispositions that relate to the self-reported use of assessment feedback, and test the mediating role of individuals' beliefs about feedback.

Psychological approaches to feedback

Theoretical accounts of learning represent the feedback process, and students' role within this process, in varying ways. Cognitive approaches typically conceptualise feedback as a one-way, linear process, and recognise that students' cognitive processing of feedback information should mediate its effect on learning outcomes (Thurlings, Vermeulen, Bastiaens, & Stijnen, 2013). In contrast, socio-constructivist approaches to feedback have gained increasing prominence in recent years (e.g., Dann, 2017; Lam, 2017). A socio-constructivist conceptualisation of feedback emphasises students actively constructing their understanding through their agentic engagement with feedback processes. Far from being a linear process, this approach characterises the feedback process as involving ongoing cycles of learning (Thurlings et al., 2013).

Implicit within a socio-constructivist model of feedback is the student as an active and dialogic partner in the process. Thus, moving towards a socio-constructivist approach to feedback requires greater understanding of the receiver's engagement with and use of the guidance they receive. However, we currently know far less about students' use of feedback than about teachers' delivery of comments (Winstone et al., 2017a). Moreover, engagement with feedback is not purely a behavioural process; feedback comments need to be understood and processed, and learners need agency and motivation to translate comments into actions (Winstone, Nash, Rowntree, & Parker, 2017b). Ellis (2010) identified engagement with feedback as comprising cognitive (e.g., attention to and processing of feedback information), behavioural (e.g., taking specific actions on the basis of feedback), and affective (e.g., defensiveness) dimensions. He argued that given the multifaceted nature of engagement with feedback, it is likely that many factors—both direct and indirect—influence engagement. However, as noted by Ellis, individual differences had received limited attention.

Recent research has provided some insight into individual differences in engagement

with feedback. Using qualitative case studies, Han and Hyland (2015) demonstrated that students differ in the extent to which they accept or resist feedback, and in their emotional reactions. In a survey, Ali, Ahmed, and Rose (2018) explored whether characteristics of the student (i.e., gender, age, and whether English was their first language), the learning environment (whether students lived on/off campus), and the programme of study (year and second subject) predicted students' self-reported engagement with feedback. The only significant predictor was year of study, with engagement declining over successive years of the programme.

Other research demonstrates that students' beliefs about the effectiveness of feedback influence their engagement with feedback (Han & Hyland, 2015). Han (2017) demonstrated that students' beliefs about the value and limitations of feedback related to their use of that information, whereby students were more likely to engage with the feedback they believed was most important. Furthermore, Storch and Wigglesworth (2010) report that if students do not believe feedback to be valuable, they are unlikely to engage with it. They also argue that goals— such as the extent to which students wish to improve—are an important influence on engagement.

In this sense, students' beliefs about the utility and purpose of feedback are likely to be important in influencing their engagement, as they would provide both cognitive and motivational impetus for action (Harks et al., 2014). However, the mediating role of students' perceptions about feedback in their processing and use of feedback has received minimal empirical attention (Harks et al., 2014). If educational practitioners wish to develop valuable interventions for supporting learners in using feedback, then there is a need to better understand individual differences in students' feedback recipience. Ellis (2010) proposes that individual factors such as motivation, personality, and feedback beliefs are likely to influence engagement with feedback. Therefore, alongside studying the feedback beliefs described

above, here we also chose to study a small number of key motivational and personality variables that should—based on prior research and theory—also relate to variability in students' feedback use.

Achievement Goal Orientation

Achievement Goal Orientation (AGO) has been described as a stable, dispositional trait (Bieg, Reindl, & Dresel, 2017; Dahling & Ruppel, 2016; Dweck & Leggett, 1988; Nakai & O'Malley, 2015), although it can also be seen as a context-specific motivational response (e.g., Cianci, Klein, & Seijts, 2010). In achievement contexts, individuals can be conceptualised as being differentially motivated by learning/mastery goals—driven to improve relative to their own prior competence—and by performance goals—driven to display competence relative to other people. Both mastery and performance goals can be characterised as involving approach motives (seeking positive outcomes) and avoidance motives (seeking to avoid negative outcomes), creating a two-dimensional framework (Elliot & McGregor, 2001). The independence of approach and avoidance dimensions has been brought into question though (e.g., Marzouq, Carr, & Slade, 2012), and the approach dimensions are typically seen as most relevant to motivation and learning outcomes (Luo, Paris, Hogan, & Luo, 2011; Phan, 2010). Therefore, following numerous prior studies (e.g., Phan, 2010; Senko, Hulleman, & Harackiewicz, 2011), we focus only on the approach dimensions of achievement goals and not the avoidance dimensions. Note also that mastery and performance goal orientations are not necessarily orthogonal; they are often moderately positively correlated (e.g., Phan, 2009).

Achievement goals function as schemas that influence the behaviours that one enacts in learning scenarios (Geitz, Brinke, & Kirschner, 2015). In academic contexts, mastery goals are typically associated with adaptive learning behaviours, whereas performance goals are associated with maladaptive behaviours (e.g. Wosnitza & Volet, 2012). Nevertheless,

performance goals have sometimes instead been associated with positive outcomes (Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008), especially in contemporary educational contexts that involve high levels of interpersonal competition, and when grades are of principal importance (Sorić, Penezić, & Burić, 2017).

AGO has been studied extensively in relation to feedback-seeking behaviour, albeit primarily in occupational rather than educational contexts. In his goal orientation model of feedback-seeking, VandeWalle (2003) proposed that the relationships between AGO and feedback-seeking are mediated by individuals' beliefs about the benefits and costs of seeking feedback information. He posited that individuals with a mastery goal orientation are more open to seeking feedback, principally because they believe that their abilities are malleable rather than fixed and hence see a value to critical feedback for facilitating their improvement. Findings from survey studies support this proposition; mastery goal orientation has been found to correlate positively with interest in receiving feedback information (Tuckey, Brewer, & Williamson, 2002), desire for self-improvement information (Janssen & Prins, 2007), and feedback-seeking behaviour (VandeWalle & Cummings, 1997). In contrast, individuals with a performance goal orientation are thought to typically believe that their abilities are fixed. Consequently, rather than viewing critical feedback as guidance for development, these individuals interpret it as personal criticism, and the associated self-esteem costs can lead them to feel distressed and to avoid seeking feedback information (Robins & Pals, 2002; VandeWalle, 2003).

Beyond feedback-seeking, AGO may also be an important dispositional factor in the context of feedback use (Dweck & Leggett, 1988). Mastery goals are associated with a focus on self-improvement, and with self-efficacy to improve on future tasks following feedback (Dahling & Ruppell, 2016; Geitz et al., 2015). Individuals with a mastery goal orientation typically believe that effort (such as that required to enact feedback) can enable them to

master future tasks (VandeWalle & Cummings, 1997). In contrast, a performance goal orientation is typically associated with a fixed view of ability and a focus on protecting self-esteem through strategies such as self-handicapping (Leondari & Gonida, 2007; Robins & Pals, 2002). Accordingly, expending effort on analysing and implementing feedback may be perceived as threatening, and not valuable, by those pursuing performance goals (VandeWalle & Cummings, 1997). Although evidence has related AGO to beliefs about, and emotional responses to, feedback, we are unaware of research that has focused specifically on its relationship with using educational feedback. Based on this research background, we predicted that mastery goal orientation would be positively associated with use of feedback, whereas performance goal orientation would be negatively associated with use of feedback, and that relevant beliefs about feedback would account for (i.e., mediate) these differences.

Personality traits

A well-established empirical literature characterises human personality as encompassing five trait dimensions: Conscientiousness, Extraversion, Agreeableness, Neuroticism, and Openness/Intellect (Costa & McCrae, 1992; Goldberg, 1992). Conscientiousness and neuroticism, in particular, are commonly associated with achievement contexts; both traits are characterised by threat sensitivity with relation to individual competence (Swift & Peterson, 2018). Conscientiousness typically shows robust positive relationships with academic achievement (O'Connor & Paunonen, 2007; Rimfeld, Kovas, Dale, & Plomin, 2016), whereas relationships between neuroticism and academic achievement are typically negative (Chamorro-Premuzic & Furnham, 2003).

It is therefore reasonable to expect that conscientiousness and neuroticism in particular would be related to the use of feedback. In a small sample of male US military leaders, for example, Smither, London, and Richmond (2005) found that the leaders' neuroticism was negatively associated with observers' ratings of their openness and

motivation to use performance feedback. In contrast, elements of their conscientiousness, such as high perceived level of responsibility, were positively associated with their use of proactive, developmental behaviours in response to feedback. Furthermore, conscientiousness is associated with the desire to improve on the basis of negative feedback (Bono & Colbert, 2005). Anxiety, a close relation of neuroticism, has been associated with reactive behavioural inhibition (Kagan & Snidman, 2009) and sensitivity to criticism (Brockner et al., 1987). The ability to manage affect is considered a core dimension of feedback literacy (Carless & Boud, 2018), insofar that it can facilitate students' uptake of feedback, and we therefore predicted that neuroticism would relate negatively to use of feedback. In contrast, we predicted that conscientiousness, due to its dutifulness and achievement-striving facets, would relate positively to use of feedback.

Beliefs about feedback

Beyond our predictions about AGO and personality traits' relationships with the use of feedback, we were also interested in the cognitive variables that might be shaped by these individual differences and thus mediate these relationships. In particular, we focused on the beliefs held by students about feedback and their role in the process. Such beliefs might reflect individuals' perceptions of the costs and benefits of expending effort on using feedback information.

An individual's 'feedback orientation' represents their beliefs about the purpose of feedback and their role in the process. Linderbaum and Levy (2010) conceptualised feedback orientation as comprising four distinct factors, measured using a validated scale: (1) utility, a belief that feedback can influence performance; (2) accountability, a belief that one is responsible for taking action in response to feedback; (3) social awareness, a recognition of the role of feedback information in monitoring how others perceive oneself; and (4) self-efficacy, a belief that one is capable of using feedback effectively.

Using latent profile analysis, Nakai and O'Malley (2015) found that students' feedback orientations were associated with variability in students' feedback-seeking behaviour, and that three distinct 'profiles' of students could be distinguished in this way. Feedback-seeking behaviour was highest in the 'instrumental enhancement' profile, who also scored the highest in all four domains of feedback orientation. The other two profiles, 'isolated instrumental' and 'undifferentiated,' showed much lower levels of feedback-seeking. In terms of feedback orientation, these two profiles both scored low on perceived utility of feedback, accountability and self-efficacy. They differed only in social awareness, implying that this dimension is not in itself crucial for informing levels of feedback-seeking. On this basis, and because we were interested people's responses to feedback information itself rather than its social consequences, we did not measure social awareness in the present study. We predicted that use of feedback would relate positively to beliefs about the utility of feedback, and individuals' sense of accountability, and self-efficacy to use feedback. We also predicted that individuals' volition to implement feedback—a further belief about feedback outside of Linderbaum and Levy's (2010) measure—would relate positively to use of feedback. Moreover, we proposed that these feedback beliefs would mediate the associations between dispositional individual differences (i.e., personality and AGO) and self-reported feedback use.

Facilitating a shift towards a socio-constructivist model of feedback requires a detailed understanding of individual differences in feedback use, so as to inform interventions that best equip students to maximise the impact of feedback they receive. Whereas research has explored individual differences in feedback-seeking and responses to critical feedback, these studies are often related to occupational rather than educational contexts (e.g., VandeWalle & Cummings, 1997), or they focus primarily on error feedback or normative performance information (e.g., Swift & Peterson, 2018), rather than on the detailed

qualitative feedback that often accompanies grades in many educational contexts.

The Present Study

Here we examined the association of personality and AGO with students' self-reported use of feedback, and the mediating role of feedback beliefs. We tested three sets of predictions, focusing on those subscales for which we had specific predictions (see Figure 1 for a conceptual model). Firstly, we predicted that mastery goal orientation and conscientiousness would relate positively to students' self-reported use of feedback, whereas performance goal orientation and neuroticism would relate negatively to these perceptions (Figure 1, paths a_1 - a_4). Secondly, we predicted that students' beliefs about the utility of feedback, their accountability to act upon it, their self-efficacy to act upon it, and their volition to use it, would all relate positively to perceived feedback use (Figure 1, paths b_1 - b_4). Thirdly, we predicted that the associations of personality and AGO with self-reported feedback use would be mediated by the students' beliefs about feedback. To test these predictions, we surveyed a sample of pre-university students.

INSERT FIGURE 1 ABOUT HERE

Method

Participants

A total of 746 students at two Further Education colleges in the UK completed this survey (463 females, 267 males, 16 other). All participants were aged 16-18 years (M_{age}= 16.80, SD_{age} = 0.76), and were pursuing A-Level courses, which are the first post-compulsory qualifications in the English education system, used as the basis for entry to university.

Materials

Use of feedback. Our primary outcome variable was the extent to which participants

reported that they actually use the feedback they receive. We measured this using a single item, as no existing measure was available that met our requirements. Specifically, participants were told that "We are interested in what students think about the feedback they receive, and how they use it as part of their learning", and they were then asked to "Please indicate the extent to which you currently put the feedback you are given from your work into action". They did so along a 101-point slider-bar response scale with three anchor points: 0 (not at all); 50 (occasionally); 100 (frequently). We did not specify which 'work' we were interested in, nor what would qualify as 'putting the feedback into action,' in order to elicit a broad subjective impression of participants' beliefs about their responsiveness to feedback. We piloted this measure with a sample of 62 university students who did not participate in the main study, to check that people's responses varied considerably and did not exhibit ceiling or floor effects (pilot sample, range = 20-92; M = 69.58, SD = 15.30; full study sample, range = 1-100; M = 63.19, SD = 19.43). Thus, both datasets evidenced substantial individual differences in self-reported use of feedback.

Achievement Goal Orientation. We measured AGO using an abridged version of the AGQ-R (Elliot & Murayama, 2008). The original scale consists of 12 items, three of which measure each of mastery approach (MAP), mastery avoidance (MAV), performance approach (PAP), and performance avoidance goals (PAV). As discussed earlier, we administered the six items that form the MAP and PAP subscales (1 = strongly disagree, 5 = strongly agree). The scale is reported to have good internal consistency (MAP α = .84, PAP α = .92; Elliot & Murayama, 2008), and this was also the case in our dataset (MAP α = .77, PAP α = .85). In our sample MAP and PAP were moderately positively correlated (r = .40).

Personality traits. The Mini-IPIP (Donnellan et al., 2006) is a 20-item instrument with four items measuring each of the five core personality traits (Intellect/Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Given that our

hypotheses focused only on Neuroticism and Conscientiousness, participants completed only the relevant eight items (1 = very inaccurate, 5 = very accurate). The Mini-IPIP is reported to have very good internal consistency (Conscientiousness α = .75, Neuroticism α = .70; Donnellan et al., 2006). In our dataset, Neuroticism had very good internal consistency (α = .75), whereas Conscientiousness had adequate internal consistency (α = .65). Although the latter figure is lower than ideal, all items correlated positively (*r*s between .22-.40), and no item negatively affected the overall scale reliability, so we retained all items.

Beliefs about feedback. We used the Feedback Orientation Scale (FOS; Linderbaum & Levy, 2010) to assess key aspects of participants' beliefs about feedback. The FOS comprises 20 items, five for each of four dimensions (1 = strongly disagree, 5 = strongly agree). The scale was developed in the context of employees' use of feedback in an occupational context; thus, we made minor changes to three items (i.e., removed the term "at work" from one item, and changed "supervisor" to "teacher" in two items). We included the utility, accountability, and self-efficacy subscales, and excluded the social awareness subscale as mentioned above. The scale has been reported to possess very good internal consistency (Utility α = .88; Accountability α = .73; Self-efficacy α = .78; Linderbaum & Levy, 2010), and in our dataset the same was true (Utility α = .87; Accountability α = .78; Self-efficacy α = .81). As the FOS does not measure students' volition to use feedback, we added a further item. Participants rated their agreement with the statement: "When I get feedback from my teacher, I am very motivated to take actions to make use of it, rather than just read it" (1 = strongly disagree, 5 = strongly agree). The use of a single item to assess a complex psychological construct like volition presents limitations in terms of reliability and validity, and we therefore adopt caution in interpreting results from this measure.

Academic achievement. Although none of our predictions specifically concerned students' academic achievement, we nevertheless assessed its association with self-reported

feedback use, to control for this relationship if necessary when hypothesis-testing. We asked participants to self-report the grades they achieved for their four core GCSE examinations (English Language, English Literature, Mathematics, Science), the final qualifications completed within compulsory education in England. GCSE pass-grades range from G to A*; however, all participants in our sample reported grades of E or above, and most scored C or above in all core subjects (unsurprising because the typical entry requirement to A-Level study is 5 GCSEs at C or above including English Language and Mathematics). Although in 2015 the English Government began a phased transition from a letter-grade system for GCSEs to a numeric grade system (1-9), all participants in this study received letter-grades. We calculated total 'tariff' scores by translating grades into numeric values (G = 1, A* = 8; range = 9-24, M = 16.98, SD = 3.33).

Procedure

A University Ethics Committee approved this study. Participants were recruited through their personal tutor groups within the college; each tutor invited students to take part in a study on 'using feedback', and participants completed the online survey during class time. After reading an online participant information sheet, students gave consent to participate. They then completed the measures described above. Afterward, all participants attended a debrief session in which the first author led a workshop on how to use feedback productively.

Results

Preliminary Analyses

All variables were normally distributed (|skew and kurtosis| < 1.56). Some feedback-related variables contained outliers (z-scores ranging from 3.29-4.05). Therefore, to estimate and test effects reported below, we used bootstrapping with 5000 resamples. The correlations presented in Table 1 help to address our first two sets of hypotheses, regarding the

associations of self-reported feedback use with (a) personality predictors, and (b) beliefs about feedback. Participants' self-reported feedback use correlated positively with both types of approach goals, as well as with conscientiousness, but was not significantly related to neuroticism as we had predicted. Furthermore, self-reported feedback use correlated positively with all three subscales of the Feedback Orientation Scale, and with volition to use feedback. Although not directly related to our predictions, self-reported use of feedback also correlated positively (albeit weakly) with self-reported academic achievement. Supplementary analyses indicated that gender (focusing only on those who identified as male or female due to the small number of other participants) did not alter or moderate any key findings, and so we do not discuss this variable further[1].

INSERT TABLE 1 ABOUT HERE

Predicting Self-Reported Use of Feedback

The remaining analyses were conducted using PROCESS v3 in SPSS (Hayes, 2018). This allows for simultaneous testing of multiple mediators in regression-based models, and was appropriate because we were interested in testing the hypothesised direct and indirect associations between variables, not in overall fit or comparison of models (as would be achieved by using structural equation modelling with latent variables). Given that self-reported academic achievement correlated with feedback use and several other variables, we controlled for it in all of these analyses. First, we conducted an initial linear regression containing all predictors of feedback use (i.e., the two achievement goal orientations, two personality traits, and four beliefs about feedback). This overall model was statistically significant, $F(9, 736) = 27.80$, $p < .001$, and explained 25.4% of the variance in self-reported feedback use. After controlling for these variables, self-reported academic achievement was

not significantly related to self-reported feedback use, $B = 0.29$, 95% CI = (-.09, .67).

Our third and final set of predictions concerned whether beliefs about feedback would mediate the associations between individual difference variables and self-reported feedback use. To test these predictions we conducted four further regressions, each examining the direct and indirect associations between one of the four key individual difference predictors (i.e., mastery approach goals, performance approach goals, conscientiousness, and neuroticism) and self-reported feedback use, whilst controlling for the other three individual difference predictors. In each model we entered perceived feedback utility, accountability, self-efficacy, and volition to implement feedback as four parallel mediators, and we estimated the indirect effects of the predictor variable via each mediator using 5,000 bootstrap resamples. We also continued to control for self-reported academic achievement.

Table 2 presents direct and indirect paths for each predictor. None of the direct effects were significant. The significant associations of both mastery approach goals and conscientiousness with self-reported feedback use were mediated by perceived utility, self-efficacy for using feedback, and volition. These findings indicate that (independently of each other), individuals who are higher in conscientiousness and mastery approach goals tend to believe feedback is more useful, and feel more capable and more motivated to use it, all of which partly account for these participants' greater self-reported use of feedback.

In contrast, the significant association of performance approach goals, and the non-significant association of neuroticism, with self-reported feedback use were mediated only by self-efficacy. It is noteworthy that despite a non-significant raw correlation between neuroticism and self-reported feedback use, a significant indirect path was detected via lower self-efficacy. Non-significant total effects do not preclude the presence of indirect effects (Hayes, 2018). Thus, people who are higher in performance approach goals tend to believe they are more capable of using feedback, and this partly accounts for their self-reported use

of feedback, whereas (independently of performance approach) highly neurotic people's perception of being less capable of using feedback undermines their perceived tendency to actually use it.

We note that the effects for each of these pathways were relatively small: completely standardised effect sizes (i.e., *SD* change in outcome via that given pathway, as a function of a 1*SD* change in the predictor) were all smaller than one-tenth of one *SD*. Nevertheless, this is in the context that all effects controlled for the other key variables, and these added together to explain one-quarter of the variance in self-reported feedback use.

INSERT TABLE 2 ABOUT HERE

Discussion

The impact of assessment feedback on students' learning and skill development can only be realised when students engage with and implement this feedback. The primary aim of the present study was to explore individual differences in students' self-reported use of assessment feedback. Our main analyses indicate that key achievement goal orientation and personality constructs were indeed associated with self-reported feedback use. Moreover, these associations were statistically mediated by the students' beliefs about feedback.

Our first individual difference construct of interest was Achievement Goal Orientation, where we focused specifically on the Mastery Approach and Performance Approach dimensions (i.e., not the avoidance-related dimensions). There was a significant positive relationship between mastery goals and reported use of feedback, which fits with prior studies showing that mastery goal orientation is related to the desire for self-improvement information (Janssen & Prins, 2007), willingness to expend effort to improve competencies (VandeWalle & Cummings, 1997), and interest in receiving feedback (Tuckey

et al., 2002). Furthermore, in the present study this relationship was mediated by students' beliefs about the utility of feedback, self-efficacy to implement feedback effectively, and self-reported volition to take action on feedback. These findings are consistent with VandeWalle's (2003) goal orientation model of feedback-seeking, and they extend the prior empirical findings to the self-reported *use* - rather than only the seeking - of feedback. VandeWalle (2003) proposed that the tendency of people with a mastery goal orientation to be more open to seeking feedback is driven by their belief in the developmental value of critical feedback. Our data provide validating evidence for these findings from an educational, rather than occupational, perspective. Furthermore, the mediating role of feedback self-efficacy in the relationship between mastery approach and use of feedback can be explained by the incremental view of ability often held by those with a mastery goal orientation (VandeWalle, 2003): a belief that improvement is achievable is likely to give students greater confidence in their ability to use feedback to facilitate this improvement.

In our sample, performance goal orientation was also positively (rather than negatively) related to self-reported use of feedback, and again this positive relationship was mediated by self-efficacy to use feedback. In the workplace, a performance goal orientation is seen as likely to inhibit feedback-seeking, both as a result of the threats to self-esteem that are associated with critical feedback (Hepper & Sedikides, 2012; VandeWalle, 2003), and the fixed view of ability that is often associated with a performance approach (VandeWalle & Cummings, 1997). Whereas a performance goal orientation has previously been associated specifically with seeking positive affirmations about one's competence (Janssen & Prins, 2007), perhaps in the educational domain individuals who pursue performance goals use feedback as a means of further demonstrating their ability in future tasks, and for gaining additional self-validation. It is also the case that in educational contexts, performance goal orientation can be positively related to academic outcomes, particularly where grades are

perceived to be important (Sorić et al., 2017). Perceived self-efficacy to implement feedback in this context may relate to students' beliefs that they can use feedback in a personally advantageous way, rather than necessarily as a facilitator of learning. In addition, the focus on approach, rather than avoidance, performance goals may have captured a more positive and proactive attitude to feedback. Indeed, some prior research has found performance approach goals to relate positively to academic self-efficacy, effort, and grades (Midgley, Kaplan, & Middleton, 2001; Mouratidis, Michou, Demircioğlu, & Sayil, 2018), whereas performance approach goals are less-strongly related to academic self-handicapping, an indicator of self-protection, than are performance avoidance goals (Leondari & Gonida, 2007). However, the evidence is mixed, and performance goals (including approach goals) also have simultaneous costs which make them less optimal for learners to adopt (Midgley et al., 2001; Senko et al., 2011). Further research is needed to unpack the differing motives for using feedback that relate to mastery versus performance approaches.

Whereas the relationship between conscientiousness and use of feedback has previously been explored in occupational contexts, there is little extant empirical evidence within the educational domain. Our data demonstrate that conscientiousness is positively related to self-reported use of feedback, and that this relationship is mediated by beliefs in the utility of feedback, self-efficacy, and self-reported volition to use feedback. In occupational contexts, conscientiousness has been associated with a desire to improve on the basis of feedback (Bono & Colbert, 2005) and with the adoption of developmental behaviours in response to feedback information (Smither et al., 2005). Our data extend these findings to the educational domain, where individuals high in conscientiousness report being motivated to use feedback, which in turn translates into self-reported actual use. It may be that the achievement-striving dimension of conscientiousness drives both beliefs in the utility of feedback, and a sense of self-efficacy and motivation to make effective use of it.

Conversely, students' neuroticism was not associated overall with self-reported use of feedback. This was unexpected given that in occupational contexts, negative associations between neuroticism and the motivation to use feedback have been demonstrated (Smither et al., 2005), and that students often report experiencing negative emotions in response to feedback (Shields, 2015; Värlander, 2008). However, we did find a significant indirect path via self-efficacy beliefs. Given that neuroticism is also associated with high levels of sensitivity to criticism (e.g. Brockner et al., 1987), it stands to reason that in response to feedback, individuals scoring high on the trait of neuroticism would lack confidence in their ability to implement feedback, which in turn may inhibit their engagement with and use of feedback information. It is possible that a simultaneous opposing path (e.g., need for approval) increases highly-neurotic individuals' use of feedback, cancelling this effect out.

Theoretical and educational implications

In a socio-constructivist approach to feedback, it is not the provision of comments themselves that is of primary focus, but students' engagement with and implementation of feedback information (Ajjawi & Boud, 2017). Understanding individual differences in the use of assessment feedback is crucial to facilitating a shift towards a socio-constructivist approach to feedback in education, yet these differences have received very little empirical attention (Harks et al., 2014). Our data suggest that endeavours to support students in their use of feedback may benefit from targeting not only students' motivation to take action, but also their fundamental beliefs about the value and utility of feedback. Most importantly, the self-efficacy to use feedback emerged as a significant mediator of the relationships between self-reported feedback use and all four of our individual difference variables. Specifically, students who reported high levels of feedback use (e.g., those high in mastery goals, performance goals, or conscientiousness) did so in part because they held a stronger sense of self-efficacy to implement feedback effectively. In contrast, lower levels of self-efficacy

mediated an indirect relationship between neuroticism and use of feedback. These patterns of findings indicate that in some cases, students may show limited use of feedback not because they are not interested in using it, but because they do not feel capable of doing so (Winstone et al., 2017a,b). Furthermore, the results suggest that although some relatively stable individual dispositions can predict students' poor engagement with feedback, these associations are to a large extent indirect. This finding resonates with Ellis's (2010) assertion that predictors of engagement are often multifaceted and indirect. Optimistically, these indirect pathways are mediated by variables that seem rather more plausible for educators to influence. Educational interventions may therefore maximise the impact of feedback, and counteract unhelpful dispositional tendencies, by giving students opportunities to develop confidence in their ability to use feedback effectively (Värlander, 2008). An example of such an intervention was reported by Winstone, Mathlin, and Nash (2019), who developed a toolkit of resources to support students in developing the skills and strategies needed to use feedback. Future work could examine whether such initiatives are effective in improving students' self-efficacy.

Limitations and future research directions

The present study has provided preliminary evidence of reliable individual differences in self-reported use of feedback, and the mediating role of beliefs about feedback in these relationships. However, the present study focused on students in the first stage of post-compulsory education in the UK (aged 16-18). Given that students' beliefs about and actions in response to feedback are likely to transfer from school to university, it is reasonable to expect comparable findings in university students. Nevertheless, this represents an important issue for future research, alongside exploring individual differences in feedback use in younger populations.

We captured students' use of feedback via a single self-report item. Demonstrating

the validity of the present findings would be more clearly achieved using measures of feedback use that are more detailed and nuanced. A single-item measure of feedback does not account for perceived variations across contexts and different forms of feedback, and could have been interpreted differently by different participants. More ideally, it is also important to explore these research questions using objective behavioural measures that focus unobtrusively on students' actual responses to feedback rather than on self-reports. Moreover, our cross-sectional data do not permit us to make causal inferences, and mediation analyses in such datasets cannot reveal the directions of effects. Longitudinal research that examines changes in feedback use over time would permit deeper insight into potential virtuous or vicious cycles; for example, whether experiences of successfully implementing feedback can reciprocally affect students' sense of self-efficacy in this domain.

We measured individual difference constructs that, on the basis of prior literature, we believed to be important in relation to use of feedback in educational contexts. However, taken together, these constructs only explained 25% of the variance in self-reported use of feedback. There are likely to be many other contributory factors, such as the quality of feedback information, and the affordance of assessment designs in facilitating the application of this information (e.g., Winstone & Carless, 2019). Future research might examine the stability of feedback use over time in order to explore the relative contributions of dispositional and situational factors. Furthermore, future research can build upon the findings from this study to help develop a theoretical model that integrates personality traits with AGO with respect to feedback.

Taken together, our findings point to systematic individual differences in the self-reported use of feedback. Our data also provide insight into the mechanisms underpinning these relationships, which include beliefs about the utility of feedback, and the self-efficacy and volition to implement feedback. Developing classroom practices that target these

mechanisms is likely to enhance the impact of feedback on learning.

Footnotes

[1] We re-conducted the mediation models among participants who identified as male or female (*n*=730) to test whether gender altered or moderated any direct or indirect effects (PROCESS model 59). Due to the large number of tests and lack of a priori theory, we used a conservative alpha level of .01 and estimated 99% confidence intervals. All key effects remained the same (i.e., significant or non-significant respectively) controlling for gender. All *indirect* effects were equivalent for both genders. Gender moderated 4 (out of 36) *direct* effects. The direct effects of mastery goals on utility, accountability, and self-efficacy were positive and significant for both genders, but stronger for male students. The direct effect of performance goals on utility was positive and significant for male students but non-significant for female students.

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Table 1

Zero-order Pearson correlations among key variables

	Gender[a]	Achievement	Mastery goals	Performance goals	Neuroticism	Conscientiousness	Utility	Accountability	Self-efficacy	Volition
Achievement	.124*	-								
Mastery Approach	.107*	.217*	-							
Performance Approach	.100*	.192*	.395*	-						
Neuroticism	.368*	.050	-.034	.084*	-					
Conscientious	.045	.109*	.302*	.116*	-.111*	-				
Utility	.093*	.120*	.378*	.218*	-.013	.269*	-			
Accountability	.031	.114*	.385*	.226*	-.021	.243*	.781*	-		
Self-efficacy	-.059	.115*	.350*	.204*	-.153*	.249*	.566*	.600*	-	
Volition	.020	.068	.332*	.149*	-.043	.214*	.439*	.399*	.385*	-
Use		**.120***	**.284***	**.141***	**-.030**	**.207***	**.361***	**.319***	**.360***	**.432***

Note. Bootstrapping with 5000 resamples identified bias ranging from .000 to .002. [a] Gender was coded 1=male, 2=female, and correlations exclude the 16 participants who did not identify as male or female. * = 95% CIs based on bootstrapping did not include zero.

Table 2

Direct and Indirect Effects in the Associations between Key Individual Differences and Self-reported use of Feedback (labelled by relevant paths in Figure 1)

Predictor	**Mediator**	**B**	**95% CI**	**Effect size**
Direct effects of mediators (paths b_1-b_4)				
Utility	-	0.72*	(0.15, 1.29)	.093
Accountability	-	-0.14	(-0.80, 0.52)	-.015
Self-efficacy	-	1.00*	(0.50, 1.51)	.144
Volition	-	4.54*	(3.36, 5.71)	.272
Achievement	-	0.37	(-0.01, 0.75)	.072
*Direct (path c') and indirect (path a*b) effects of individual difference variables on feedback use*				
Mastery Approach	Utility	0.33*	(0.05, 0.67)	.037
	Accountability	-0.10	(-0.41, 0.19)	-.011
	Self-efficacy	0.36*	(0.12, 0.62)	.041
	Volition	0.75*	(0.47, 1.06)	.084
	Direct effect	*0.64*	*(-0.04, 1.32)*	*.072*
Performance Approach	Utility	0.07	(-0.01, 0.20)	.010
	Accountability	-0.23	(-0.12, 0.06)	-.003
	Self-efficacy	0.11*	(0.01, 0.24)	.014
	Volition	0.06	(-0.12, 0.25)	.008
	Direct effect	*0.01*	*(-0.51, 0.53)*	*.001*
Neuroticism	Utility	0.01	(-0.04, 0.07)	.001
	Accountability	0.00	(-0.02, 0.03)	.000
	Self-efficacy	-0.12*	(-0.22, -0.03)	-.022
	Volition	-0.03	(-0.15, 0.09)	-.006
	Direct effect	*0.07*	*(-0.27, 0.41)*	*.013*
Conscien-tiousness	Utility	0.13*	(0.02, 0.27)	.021
	Accountability	-0.03	(-0.13, 0.06)	-.005
	Self-efficacy	0.14*	(0.03, 0.27)	.022
	Volition	0.22*	(0.08, 0.38)	.036
	Direct effect	*0.33*	*(-0.08, 0.74)*	*.054*

Note. All models controlled for academic achievement and the other predictors, and so can be interpreted as unique effects. Direct effects of mediators were identical in all four models, and these effect sizes are partial correlations. Effect sizes from mediation models are completely standardised effect sizes, which indicate the effect in relation to the standard deviations of the predictor variables; that is, the *SD* change in outcome via the given indirect pathway as a result of 1*SD* change in the predictor (Hayes, 2018).
*95% CI did not contain zero.

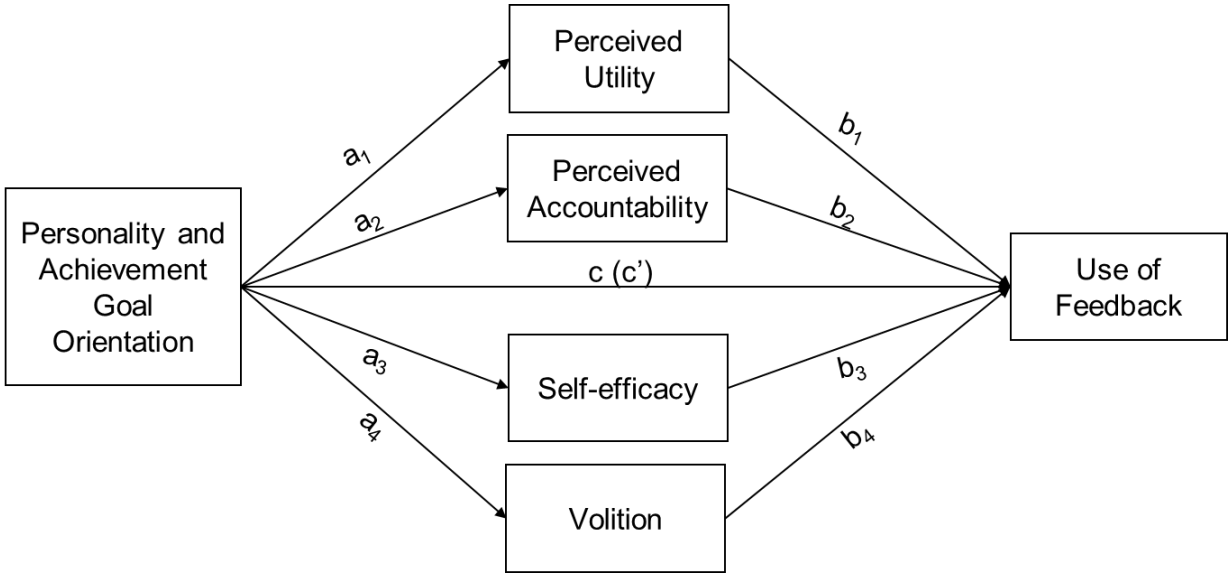

Figure 1. Conceptual model depicting the hypothesised associations of personality (conscientiousness, neuroticism) and achievement goal orientation (mastery approach, performance approach) with use of feedback, mediated by feedback beliefs.