

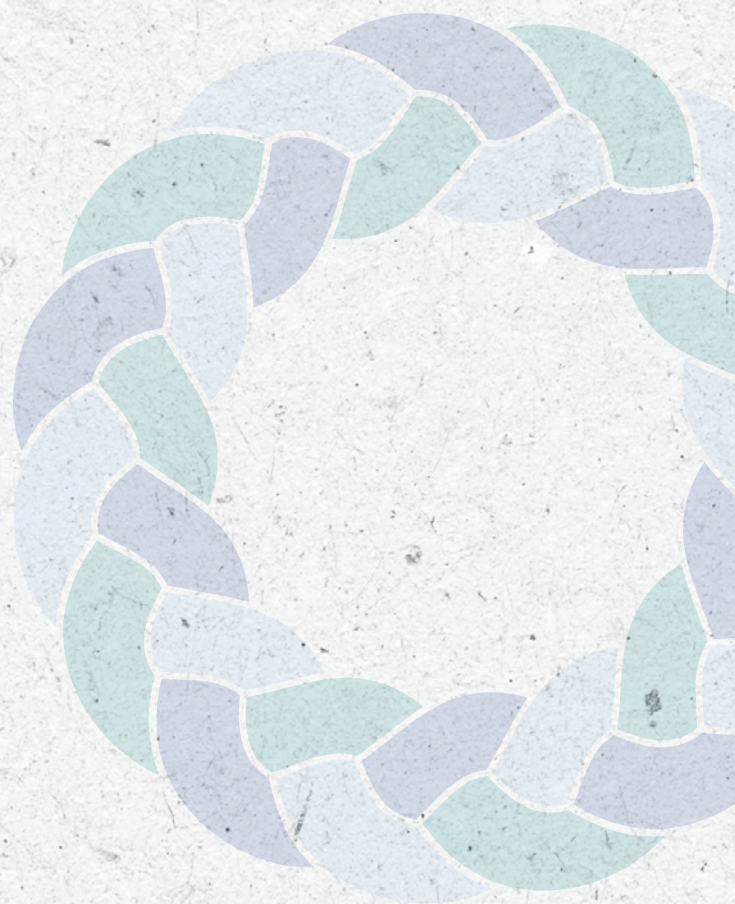
Rapid Evidence Assessment (REA)



EFFECT OF FEEDBACK ON WORKPLACE PERFORMANCE

a summary of research literature

July 2019



Culture Review **Implementation**
our journey of positive change



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Background

Novartis, a global pharmaceutical company with 98,000 employees, is involved in several projects to enhance organisational effectiveness and performance. Part of this effort is to replace current performance appraisal practices with a performance management system that is based on three hypotheses:

1. When associates know that their contribution matters, performance will increase.
2. When associates receive frequent and quality feedback, performance will increase.
3. When associates are recognised & rewarded for their contributions, performance will increase.

Although these three hypotheses appear to make sense from a managerial perspective, it is yet unclear whether they are supported (or contradicted) by scientific evidence. For this reason, Novartis approached the Center for Evidence Based Management (CEBMA) to undertake a Rapid Evidence Assessment (REA) to understand what is known in the scientific literature about the link between culture and performance. This review presents an overview of the scientific evidence on performance feedback.

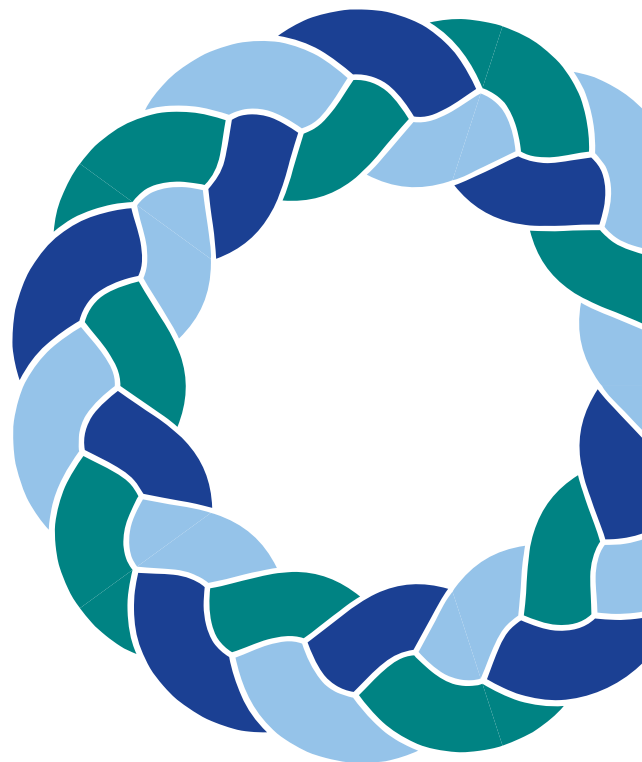




What is a Rapid Evidence Assessment (REA)?

Evidence reviews come in many forms. One of the best-known types is the conventional literature review, which provides an overview of the relevant scientific literature published on a topic. However, a conventional literature review's trustworthiness is often low: clear criteria for inclusion is often lacking and studies are selected based on the researcher's individual preferences. As a result, conventional literature reviews are prone to severe bias. This is why 'rapid evidence assessments' (REAs) are used.

This type of review uses a specific research methodology to identify the most relevant studies on a specific topic as comprehensively as possible, and to select appropriate studies based on explicit criteria. In addition, the methodological quality of the studies included is assessed by two independent reviewers on the basis of explicit criteria. In contrast to a conventional literature review, a REA is transparent, verifiable, and reproducible, and, as a result, the likelihood of bias is considerably smaller.

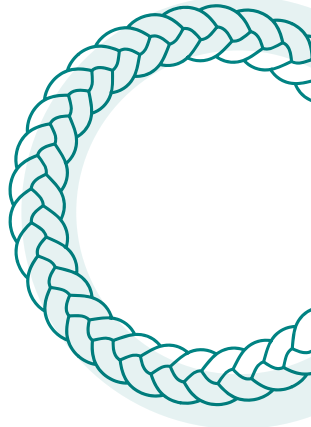




Main question: What does this REA answer?

What is known in the research literature about the link between an employee's or team's performance and receiving feedback?

Other issues raised, which will form the basis of our conclusion to the three questions above, are:

1. **What is meant by feedback (what is it)?**
 2. **What is the assumed logic model (how is it supposed to enhance performance)?**
 3. **What is the overall effect on performance?**
 4. **What is known about the (positive or negative) effect of possible moderators and/or mediators?**
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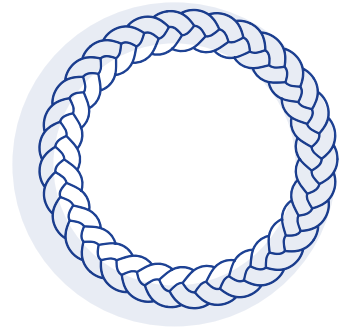
Search strategy: How was the research evidence sought?

The following three databases were used to identify studies: ABI/INFORM Global, Business Source Premier and PsycINFO. The following generic search filters were applied to all databases during the search:

1. **Scholarly journals, peer-reviewed.**
2. **Published in the period 2010 to 2019.**
3. **Articles in English.**

A search was conducted using combinations of different search terms, such as 'performance', 'feedback', 'feedback intervention' and 'feedback seeking behaviour'. In addition, the references listed in the studies retrieved were screened in order to identify additional articles for possible inclusion in the REA. Finally, relevant studies from a REA on Performance Appraisal conducted by CEBMa in 2017 were included. Most of these studies were published in the period 1980 to 2016 (meta-analyses) and the period 2000 to 2016 (primary studies).

We conducted six different search queries and screened the titles and abstracts of more than 250 studies. An overview of all search terms and queries is provided in Appendix I.



Selection process: How were the studies selected?

Two reviewers worked independently to identify which studies should be included. Where the reviewers disagreed on selection, a third reviewer assessed whether the study was appropriate for inclusion with no prior knowledge of the initial reviewers' assessments. The decision of the third reviewer was final.

Study selection took place in two phases. First, the titles and abstracts of the studies identified were screened for their relevance to this review. In case of doubt or lack of information, the study was included. Duplicate publications were removed. This first phase yielded 12 secondary studies (meta-analyses) and 18 primary studies.

Secondly, studies were selected based on the full text of the article according to the following inclusion criteria:

1. **Type of studies:** Only quantitative, empirical studies.
2. **Measurement:** Only studies in which the link between feedback and organisational outcomes was tested
3. **Context:** Only studies on feedback related to workplace settings
4. **Level of trustworthiness:** Only studies that were graded level C or above (see below).

In addition, the following exclusion criteria were applied:

- Task-generated feedback obtained without an intervention.
- Feedback from co-workers or clients.
- Personal feedback that does not relate to task performance.

This second phase yielded three secondary studies and 17 primary studies. In addition, three secondary studies and three primary studies that were included in previous REAs were added. An overview of the selection process is provided in Appendix II.





Critical appraisal: How were the quality of the included studies judged?

In almost any situation it is possible to find a scientific study to support or refute a theory or a claim. Thus it is important to determine which studies are trustworthy (i.e. valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. For cause-and-effect claims (i.e. if we do A, will it result in B?), a study has a high methodological appropriateness when it fulfils the three conditions required for causal inference: co-variation, time-order relationship, and elimination of plausible alternative causes (Shaughnessy & Zechmeister, 2006).

A study that uses a control group, random assignment and a before-and-after measurement is therefore regarded as the 'gold standard'. Non-randomised studies and before-after studies come next in terms of appropriateness. Cross-sectional studies (surveys) and case studies are regarded as having the greatest chance of showing bias in the outcome and therefore fall lower in the ranking in terms of appropriateness. Meta-analyses in which statistical analysis techniques are used to pool the results of controlled studies are therefore regarded as the most appropriate design.

To determine the methodological appropriateness of the included studies' research design, the classification system of Shadish, Cook and Campbell (2002), and Petticrew and Roberts (2006) was used. The following four levels of appropriateness were used for the classification:

Design	Level
Systematic review or meta-analysis of randomised controlled studies	AA
Systematic review or meta-analysis of controlled before-after studies	A
Randomised controlled study	
Systematic review or meta-analysis of non-controlled and/or before-after studies	B
Non randomised controlled before-after study	
Interrupted time series	
Systematic review or meta-analysis of cross-sectional studies	C
Controlled study without a pretest or uncontrolled study with a pretest	
Cross-sectional study	D

It should be noted, however, that the level of methodological appropriateness as explained above is only relevant in assessing the validity of a cause-and-effect relationship that might exist between a predictor/driver (organisational culture) and its outcomes (performance), which is the purpose of this review.

In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Based on a tally of the number of weaknesses, the trustworthiness was downgraded and the final level determined as follows: a downgrade of one level if two weaknesses were identified; a downgrade of two levels if four weaknesses were identified, etc.

Finally, the effect sizes were identified. An effect (e.g. a correlation, Cohen's d or ω) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size – a standard measure of the magnitude of the effect – of the studies included was assessed. To determine the magnitude of an effect, Cohen's rules of thumb (Cohen, 1988) were applied. According to Cohen a 'small' effect is an effect that is only visible through careful examination. A 'medium' effect, however, is one that is 'visible to the naked eye of the careful observer'. Finally, a 'large' effect is one that anybody can easily see because it is substantial.

Outcome of the critical appraisal

The overall quality of the studies included was high. Most of the secondary studies were based on controlled studies and were therefore graded level A or higher. Of the 20 primary studies, 13 qualified as randomised controlled studies and were therefore graded level A. The remaining 7 studies concerned quasi-experimental or longitudinal designs and were graded level B or lower. An overview of all the studies included and information regarding year of publication, research design, sample size, population, main findings, effect sizes and limitations is provided in Appendix III (secondary studies) and Appendix IV (primary studies).

Main findings



1. What is meant by feedback?

Feedback is generally defined as information about a person's performance which is used as a basis for improvement. In the domain of management, feedback is referred to 'feedback intervention' or 'performance' feedback', and is often defined as 'actions taken by (an) external agent (s) to provide information regarding some aspect(s) of one's task performance.' (Kluger and Denisi, 1996).

2. What is the assumed logic model? (How is it supposed to work?)

The assumed logic model performance feedback is based on two theories: social comparison theory (Festinger, 1954) and feedback intervention theory (Kluger & DeNisi, 1996). Social comparison theory suggests that individuals tend to compare themselves with others in order to make judgments regarding their performance. They are concerned not only about their performance in an absolute sense, but also about how they measure up in relation to relevant peers. In addition, this theory suggests that individuals have a strong desire to improve their performance when faced with unfavorable comparative information.

Feedback intervention theory suggests that when confronted with a discrepancy between what they wish to achieve and the feedback received, individuals are strongly motivated to attain a higher level of performance. The practice of performance feedback therefore assumes that informing an employee about the discrepancies between the organisation's standard and his/her current performance – implying that he/she is achieving less than most other colleagues – will motivate the employee to attain a higher level of performance.



3. What is the effect of feedback on workplace performance?

Finding 1: There is strong evidence that feedback can have a large effect on people's learning and performance (level A)

There is wide consensus among both scholars and practitioners that feedback, in general, can have a large, positive impact on a wide range of performance outcomes. As stated above, both social comparison theory and feedback theory posit that providing feedback to people regarding their relative performance can enhance performance. There is indeed strong evidence from controlled studies that feedback is among the most powerful influences on performance.

For example, the seminal work of John Hattie that is based on a review of 23 meta-analyses demonstrates large effect sizes ($d = .73$). In the realm of management, this finding is confirmed by the meta-analysis by Kluger and Denisi (1996). This meta-analysis included 131 controlled studies and was based on 12,652 participants found an average effect size of $d = .41$.

Finding 2: The effect sizes reported show considerable variability, indicating that the effect of feedback is contingent upon various moderating factors (level A)

The scientific literature on feedback interventions, however, suggests a caveat. Several researchers have pointed out that feedback may not always be effective. In fact, several meta-analyses have demonstrated that feedback interventions have highly variable effects on performance – in some situations feedback improves performance, but in other situations it has no apparent effect or even harms it (Kluger & DeNisi, 1996; Smither et al., 2005).

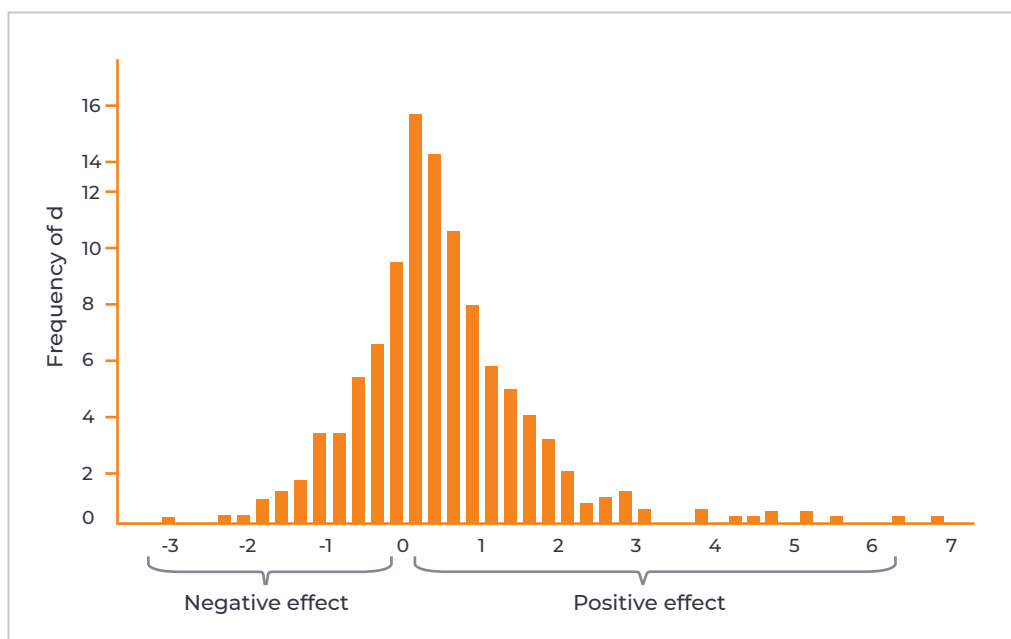


Figure 1. Distribution of 607 effect sizes (ds) of feedback intervention of performance (Kluger & DeNisi, 1996)

Similar results have been reported in meta-analyses of multi-source feedback: some of the studies included reported performance improvements, while some did not, and others reported inconclusive results (e.g. Smither et al., 2005). These findings suggest that the effect of performance appraisal is moderated and/or mediated by several factors¹. As a consequence, the key question is not 'What is the effect of feedback on workplace performance?', but 'Given the target group, the objectives and the context involved, what are the factors moderating or mediating the effect of performance feedback that need to be taken into account?'

4. What is known about the positive or negative effect of possible moderators and/or mediators?

Finding 3: Reactions to feedback, rather than the feedback itself, influence performance (Level A)

As previously stated, research has found that although feedback generally improves performance, in more than one third of the studies, feedback lowered performance. Several theoretical models propose that people's reactions to feedback likely determine the extent to which they will use it to improve performance (e.g., Ilgen et al., 1979; Murphy & Cleveland, 1995; Ilies, 2010). People have several behavioural options when confronted with a discrepancy between what they wish to achieve and the performance feedback received.

For example, they can accept the feedback and put in more effort to improve their performance, but they can also reject the feedback, feel angry and/or disappointed, and shift their attention away from their tasks. In the meta-analysis by Kluger and DeNisi it was found that the last option is likely when the feedback threatens an employee's self-esteem. A similar finding is found in the meta-analysis by Smither et al.: employees who express positive emotions immediately after receiving feedback show higher performance ratings, but those who express negative emotions show lower performance ratings.

¹A moderator is a variable that affects the direction and/or strength of the relation between an independent or predictor variable (in this case performance feedback) and an outcome variable (work performance). Put differently, moderators indicate when or under what conditions a particular effect can be expected. A mediator is a variable that specifies the mechanism that needs to be triggered for an effect to occur. Thus, if you remove the effect of the mediator, the relationship between the independent or predictor variable (in this case performance feedback) and the outcome variable (work performance) will disappear. In short, moderators specify when a certain effect will hold, whereas mediators determine how or why the effect occurs.

Finding 4: Personality variables moderate reaction to the feedback (Level n/a)²

Personality variables can moderate the reaction to (negative) feedback, but they fall outside the focus of this REA. Among the personality variables that are known to be involved in the reaction to feedback are self-esteem and locus of control (e.g., Ilgen et al., 1979), tendency for cognitive interference (Kuhl, 1992; Mikulincer, 1989a), competitiveness (Raver, 2012), altruism (Korsgaard, Meglino & Lester, 1994) and openness to feedback (Smither et al., 2005).

Finding 5: The effect of feedback is moderated by task type (Level A)

Findings from a randomised controlled study demonstrate that the effect of feedback on motivation and performance is moderated by task type. Some tasks (e.g., tasks requiring creativity) are perceived as promotion tasks, whereas others (e.g., those requiring vigilance and attention to detail) are perceived as prevention tasks. It was found that positive feedback increased (self-reported) motivation and actual performance among people working on promotion tasks, relative to negative feedback. Positive feedback, however, decreased motivation and performance among individuals working on prevention tasks, relative to negative feedback (Van Dijk, 2011).

Finding 6: The effect of feedback is moderated by the type of goal (Level AA)

Several meta-analyses demonstrate that, goals-setting has stronger positive effects on performance when combined with performance feedback or progress monitoring, especially when the outcomes are reported or made public (Harkin, 2016). However, the reverse is also true: the effect of feedback is influenced by the type of goal. Specifically, feedback is more effective when goals are clear, specific and challenging, but when task complexity is low (e.g. Locke & Latham, 2002, 2006; Brown, 2005; Brown & Warren, 2009; Brown et al 2011; Rahyuda et al, 2014). Goals must therefore be made as difficult but realistic as the individuals can cope with.

In addition, goals must be challenging and stimulating the individual motivation. However, when employees need to acquire knowledge or skills in order to perform a task, or when the task involved is complex, then learning goals tend to have a more positive effect on performance than outcome goals (Winters & Latham, 1996; Brown & Latham, 2002; Latham & Brown, 2006; Porter and Latham, 2013). Consequently, in those situations feedback should focus on the (learning) process rather than the (performance) outcome.

²The studies mentioned here are not included in this REA, so their quality was not evaluated.

Finding 7: The perceived fairness of the feedback has a medium to large moderating effect on performance (Level A)

A fair process is widely regarded as a prerequisite for the effectiveness of performance feedback, a construct that in academia is often referred to as procedural justice. This reflects 'the perceived fairness of decision-making processes and the degree to which they are consistent, accurate, unbiased, and open to voice and input' (Colquitt et al., 2013). Empirical research has demonstrated that when procedures are perceived as fair, reactions are favorable, generally regardless of the outcome. This interaction effect is called the fair process effect and has been shown empirically in several studies in different contexts (for a review, see Brockner & Wiesenfeld, 1996).

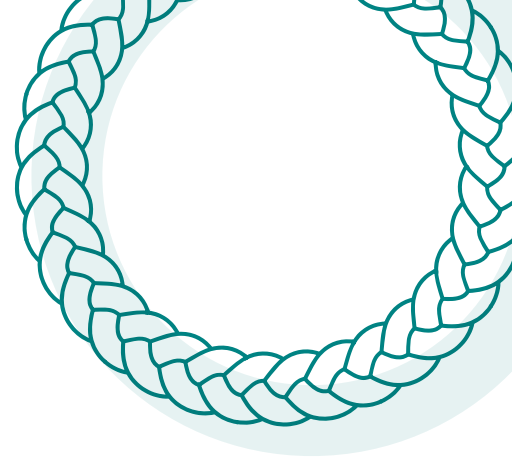
A before-after study found that performance appraisal incorporating the principles of fairness and due process tends to positively affect employees' reactions to feedback and their resulting overall job performance (Jawahar, 2010). In addition, a recent randomised controlled study confirmed this finding and demonstrated that employees' perceptions of fairness had an effect on the relationship between feedback and overall task performance (Budworth et al., 2014).

Finding 8: Feedback which provides detailed information leads to a higher improvement in performance (Level A)

Findings from randomised controlled studies demonstrate that feedback which provides elaborated, detailed, and specific information leads to a higher improvement in performance (e.g. Raemdonck, 2013; Casas-Arke, 2017). For this reason, task-related feedback is more effective than general feedback (Johnson, 2015).

Finding 9: The effect of feedback, particularly negative feedback, is moderated by the feedback source (Level A)

Findings from a recent controlled study suggests that the effectiveness of performance feedback, particularly negative feedback, depends on the feedback source (Holderness, 2017). This finding confirms the results of a cross-sectional study, indicating that employees are more motivated to rely on negative feedback when the supervisor's credibility is high. (Steelman & Rutkowski, 2004).

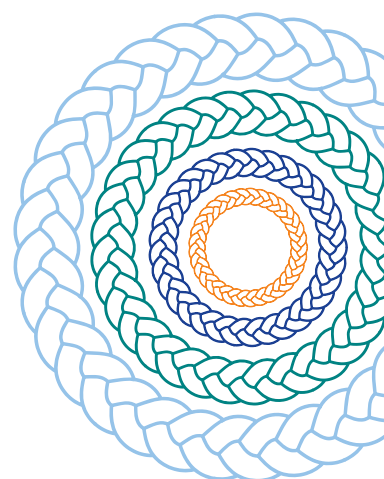


Finding 10: Negative feedback adversely affects perceived fairness (level C), whereas feedback that focusses only on positive aspects has a medium positive effect on both perceived fairness and overall job performance (Level A)

The outcome of a longitudinal study suggests that employees who receive negative performance-appraisal feedback report lower perceptions of fairness. This effect even persists six months after the performance appraisal (Lam et al., 2002). In addition, randomised controlled studies demonstrate that employees who receive feedback that focuses only on positive aspects (such as the employee's strength and accomplishments)³ perform significantly better on the job four months later than employees who receive a 'traditional' feedback (Murthy, 2011; Budworth et al., 2014). This outcome confirms the findings of meta-analyses in the domain of education that indicate that feedback is more effective when it provides information on correct rather than incorrect responses (Hattie, 2009).

Finding 11: Feedback is less effective when it is perceived as threatening one's self esteem (Level A)

A recent longitudinal study suggests that negative feedback is associated with lower self-efficacy improvement. In addition, it was found that feedback is less effective when it is perceived as threatening one's self esteem (Dimotakis, 2017). This finding confirms the outcome of a large number of meta-analysis in the domain of education, showing that low threat conditions allow students to pay better attention to and follow up on feedback (Hattie, 2009)



³This type of feedback is also known as 'feedforward', see Kluger & Nir, 2010)

Other relevant findings

Finding 12: In general, managers overestimate how accurately their feedback is perceived by their employees, especially when the feedback is negative (Level D)

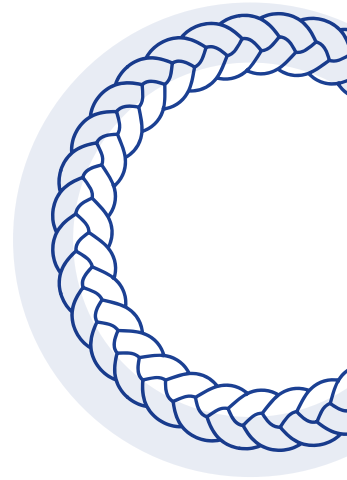
The outcome of a recent cross-sectional study suggests that managers overestimate how accurately their feedback is perceived by their employees (Schaerer, 2018). Managers generally anticipated that their feedback would be understood by their employees more negatively than employees actually understood. This gap between managers and employees is more pronounced when the feedback is negative than when it is positive. When the feedback was negative, managers' anticipated feedback rating was significantly lower than what employees actually understood. This gap may occur because managers are less motivated to be accurate when the feedback is negative, or that negative feedback is more difficult for employees to process.

Finding 13: Employees' reactions to feedback are influenced by the language managers use in their explanations (Level A)

Results from randomised controlled studies indicate that employees' cognitive processes and reactions to performance feedback are influenced by the language used in explanations (Murthy, 2011; Loftus, 2018). Specifically, when performance is low, the high use of causal language (eg "your performance is under average because ...") in the resulting negative performance feedback leads to a greater improvement in subsequent performance, compared to low use of causal language. However, when performance is high, greater use of causal language in delivering positive feedback results in a smaller improvement in performance (Loftus, 2018).

Finding 14: More (and more frequent) feedback does not always help improve performance (Level A)

Contrary to what is widely assumed, a recent randomised controlled study found that more and more frequent feedback does not always help improve performance. In fact, it was found that employees achieve the best outcomes when they receive detailed but more intermittent (monthly) feedback (Casas-Arke, 2017).





Conclusion

Based on the evidence found, we conclude that performance feedback can have large positive effects on work performance, but that these effects are highly contingent upon a wide range of moderating factors, many of which can be managed by effective feedback processes.

Limitations

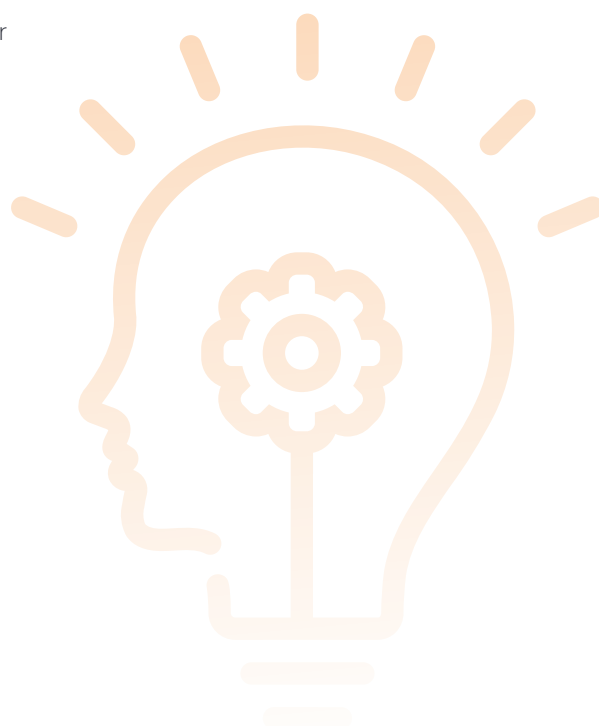
This REA aims to provide a balanced assessment of what is known in the scientific literature about the effects of feedback on work performance by using the systematic review method to search and critically appraise empirical studies. However, in order to be 'rapid', concessions were made in relation to the breadth and depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on empirical research published in the period 1990 to 2019 for meta-analyses and the period 2010 to 2019 for primary studies. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of the tests, scales and questionnaires used. In addition, it should be noted that some of the studies included used performance ratings as an outcome measure, not objective performance indicators.

A third limitation concerns the fact that the evidence on some moderators is based on only one study. Although most of these studies were well controlled or even randomised, no single study can be considered to be strong evidence – it is merely indicative.

Finally, this REA focused only on high-quality studies, i.e. studies with a control group and/or a before- and after-measurement. For this reason, cross-sectional studies were excluded. As a consequence, new, promising findings that are relevant for practice may have been missed.

Given these limitations, care must be taken not to present the findings presented in this REA as conclusive.



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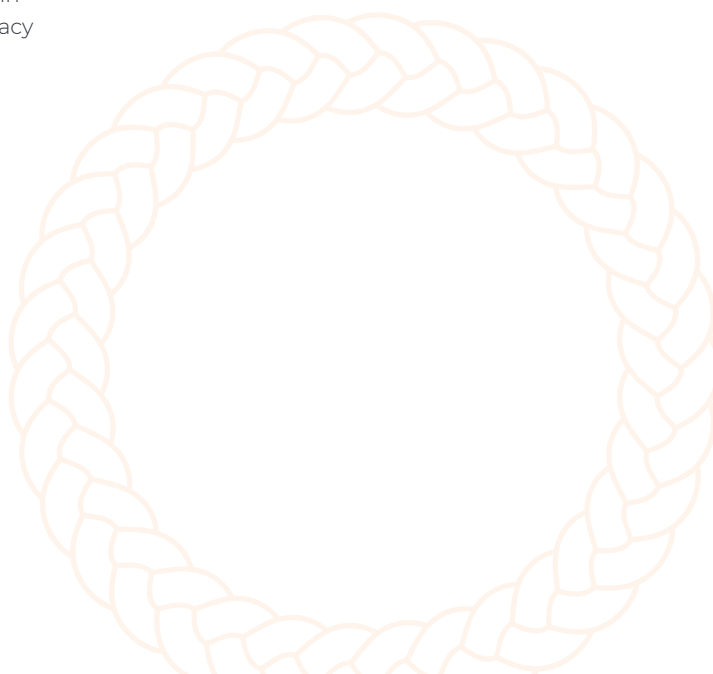
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Appendix I

Search terms & hits

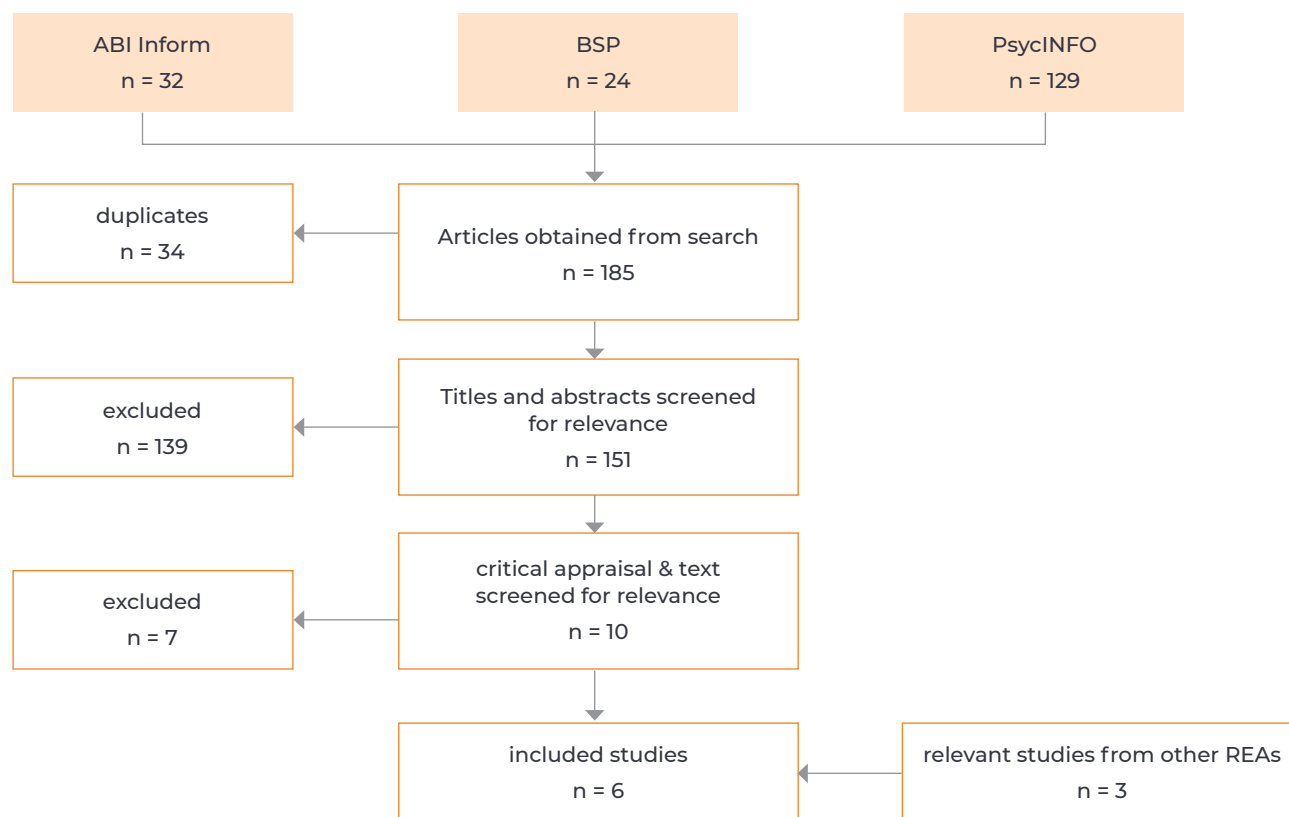
**ABI/Inform Global, Business Source Elite, PsycINFO
peer reviewed, scholarly journals, June 2019**

Search terms	ABI	BSP	PSY
S1: ti(feedback) OR ab(feedback)	19,610	29,832	47,226
S2: ab(work*) OR ab(employe*) OR ab(performance)	552,997	509,023	758,864
S3: S1 AND S2	8,061	9,625	16,903
S4: ab("performance feedback")	521	228	898
S5: S3 filter meta-analysis or systematic reviews > 2010	32	24	129
S6: S4 filter controlled and/or longitudinal studies > 2010	62	71	25

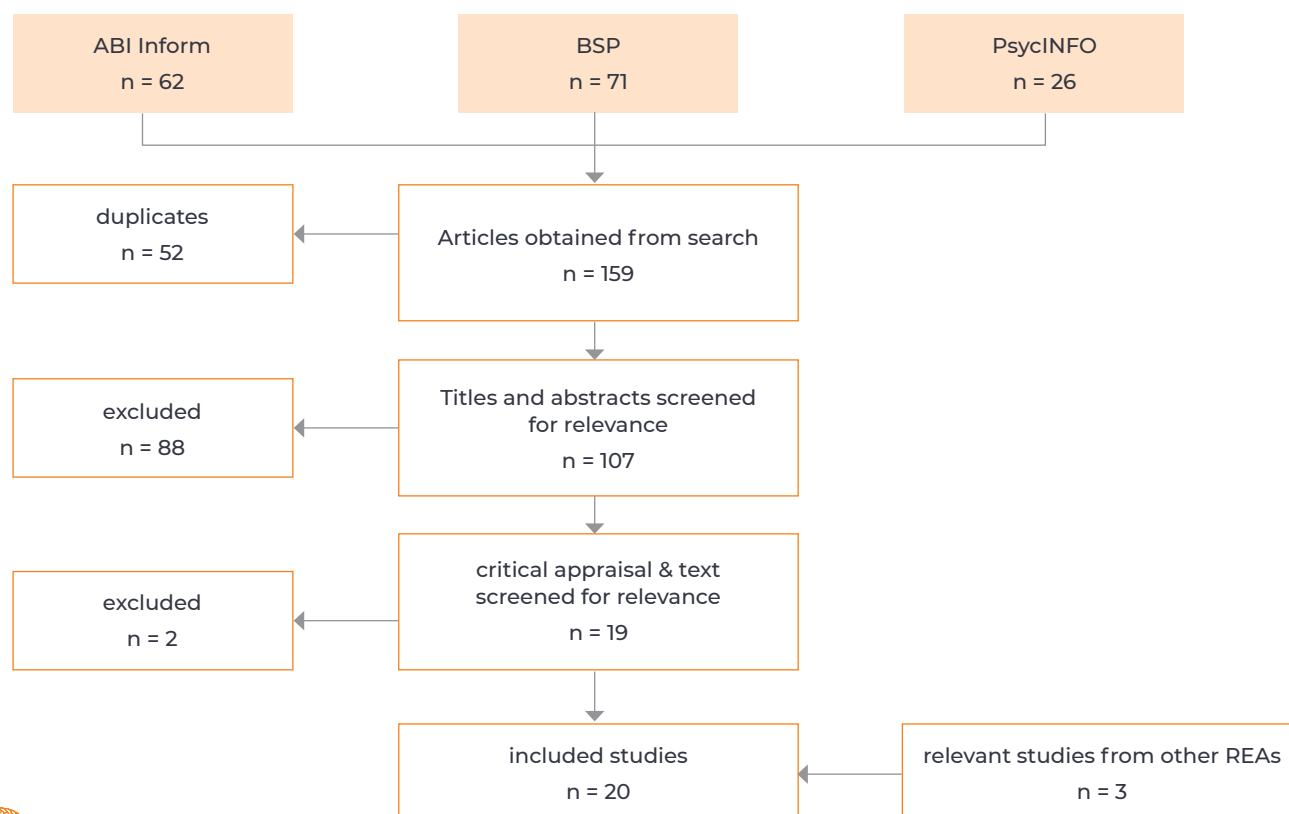
Appendix II

Selection of studies

Meta-analyses or Systematic Reviews



Primary studies



Appendix III

Overview of included meta-analyses

1st Author & year	Design included studies & sample size	Sector / Population	Main findings	Effect sizes	Limitations	Level
Anseel, 2015	Not specified k = 96	general	<ol style="list-style-type: none"> 1. There is a small positive relationship between FSB and task performance. 2. Value perceptions (e.g. uncertainty reduction) is positively related to FSB. 3. Organisational tenure, job tenure, and age is negatively related to FSB. 4. There is a positive relationship between the amount of positive feedback received and FSB. 5. There is a positive relationship between the amount of negative feedback received and FSB. 	1: $p = ns$ (.07) 2: $p = .44$ 3: $p = -.19$ / $-.15$ / $-.13$ 4: $p = .23$ 5: $p = .46$	No serious limitations	C
Bozer, 2018	Studies reporting psychometric qualities of MSF instruments k = 43	physicians	<p>The use of MSF has been shown to be an effective method for providing feedback to physicians from a multitude of specialties about their clinical and nonclinical (i.e., professionalism, communication, interpersonal relationship, management) performance.</p> <p>The use of MSF employing medical colleagues, coworkers, and patients as a method to assess physicians in practice has been shown to have high reliability, validity, and feasibility</p>	not reported	No serious limitations	A
Epton, 2017	Controlled and uncontrolled studies k = 25	Diverse	The study did not add support to the claim of goal setting theory that feedback increases the effectiveness of goal setting as including feedback (k = 25) was not associated with a significant effect on behaviour and outcomes ; however the sample size was moderate so strong conclusions cannot be drawn.	0	Very diverse population (children, adults, athletes, etc), type of goals unclear, quality of the included studies not evaluated.	B

Harkin, 2016	RCT's k = 138	Diverse	Results showed that, on average, interventions were successful at increasing the frequency of monitoring goal progress (1) and promoted goal attainment (2). Furthermore, changes in the frequency of progress monitoring mediated the effect of the interventions on goal attainment. Moderation tests revealed that progress monitoring had larger effects on goal attainment when the outcomes were reported or made public, and when the information was physically recorded. Taken together, the findings suggest that monitoring goal progress is an effective self-regulation strategy, and that interventions that increase the frequency of progress monitoring are likely to promote behaviour change.	1: d = 1.98 2: d = 0.40	No serious limitations	AA
Kluger (1996)	Controlled studies, k = 131	Diverse	Findings suggests that feedback intervention (FI) improved performance on average but that over 1/3 of the FI's decreased performance. FI effectiveness decreases as attention moves up the hierarchy closer to the self and away from the task.	d = .41	No serious limitations	A
Smither, 2005	Controlled and longitudinal studies k = 24	Diverse	Effect of multisource feedback on performance improvement is examined. Improvement in direct report, peer and supervisor ratings over time is generally small. Differences in effect sizes for different study methodologies were not significant. Neither were effect sizes for direct report feedback to whether rates received feedback only from direct reports versus direct reports and other sources. For direct report and self-ratings, effect sizes were significantly larger when two administrations of the feedback program were separated by less than 12 months. Improvement is most likely to occur when feedback indicates that change is necessary, recipients have a positive feedback orientation, perceive a need to change their behaviour, react positively to the feedback, believe change is feasible, set appropriate goals to regulate their behaviour and take actions that lead to skill and performance improvement.	Direct reports d = .15 Peers d = .05 Supervisors d = .15 Self d = -.04 Direct reports - time: <12 months corrected mean d = .28; > 12 months d = .13 Self - time: <12 months corrected mean d = .14; > 12 months d = -.14	Publication bias? Quality of the studies included not assessed	A

Overview of excluded meta-analyses

Bos-Nehles, 2017	Qualitative review, no quantitative outcomes are reported.
Boyce, 2013	Not relevant given the REA population: the study population concerns physicians and the outcome concerns patient-reported outcome measures, not necessarily provided through a supervisor or manager.
Bozer, 2018	Qualitative review, no quantitative outcomes are reported.
Byron, 2012	Examines whether performance feedback moderates rewards–creative performance relationship.
Jones, 2016	The study reports only the effects of coaching combined with multi-source feedback on affective, skill-based, and individual-level results outcomes, without differentiating between outcomes.
Miller, 2010	Qualitative review, no quantitative outcomes are reported.
Nowack, 2012	Qualitative review, no quantitative outcomes are reported.

Appendix IV

Overview Controlled and Longitudinal Studies

Author & year	Sector / Population	Design and sample size	Main findings	Effect size	Limitations	Level
Bipp, 2018	Engineering students at a Dutch technical university	Study1: RCT (2x2 factorial between-subjects design) n=80	The results of the Study1 demonstrate that persons holding subconscious goals report higher self-efficacy (H1a) and higher performance (H1b) compared with persons not holding subconscious goals when receiving no feedback, whereas they report lower self-efficacy/lower performance, when receiving negative personal-discrepancy feedback. Moreover, the findings of this study suggest that self-efficacy mediates the interaction effect of subconscious goals and (negative goal-discrepancy and comparison) feedback on performance (H4).	Study 1: H1 (a): $\beta=.07$, (b): $\beta=.06$, H4: $b=.07$	no serious weaknesses	A
		Study2: RCT (3x2 factorial between-subjects design) n=90	According to the results of the Study 2, neither the interaction effect of priming and feedback (H2a), nor the interaction effect of subconscious goals and feedback was evident. However, the findings show that persons holding subconscious goals report lower self-efficacy/lower performance compared with persons not holding subconscious goals when receiving negative personal feedback alone, whereas persons holding subconscious goals will report higher self-efficacy (H3.2a) and higher performance (H3.2b) compared with persons not holding subconscious goals when comparison feedback that indicates a negative discrepancy between one's own and others' performance is also provided. The findings of the Study 2 did not support hypothesis 4.	Study 2: H2 (a): ns (b): ns H3 (2a): $\beta=.12$, (2b): $\beta=.14$, H4: ns		
Budworth, 2014	Managers and their subordinates in a Canadian business equipment firm	RCT n=25 (managers) & 70 (subordinates)	Employees who engaged in a feed-forward interview with their manager were observed by an anonymous peer to perform significantly better on the job four months later than employees who received the company's traditional performance appraisal interview. In addition, it was found that perceived fairness functioned as a suppressor variable.	$d = .41$	no serious limitations	A
Casas-Arke, 2017	Home repair workers at Spanish insurance repair company	RCT (field experiment), n=800	Findings demonstrate that feedback which provide detailed information leads to a significant improvement in performance. However, contrary to what was expected, if professionals used all the information available, detailed information is only useful when provided over a sufficient time interval. When feedback is too frequent, professionals perform significantly worse than a group with detailed and less frequent information.	not reported	no serious weaknesses	A

Choi, 2018	Undergraduate and graduate students of a large Korean university	RCT, (between/within-subject design), n=120	Findings demonstrate that work performance showed a significant increase in all feedback sequences (positive-positive, positive-negative, negative-positive, negative-negative). Moreover, uniform feedback delivery (i.e., only positive or only negative feedback) resulted in higher performance than inconsistent feedback (i.e., positive-negative, negative-positive). Inconsistent feedback, however, resulted in lessened negative emotional responses.	not reported, not enough data to calculate them	no serious weaknesses	A
Dimotakis, 2017	employees from a large telecommunication center	Longitudinal study n = 126	Negative feedback is associated with lower improvement self-efficacy. Higher levels of social support reduced the impact of negative feedback.	small	Large number of dropouts	C
van Dijk, 2011	MBA and undergrad students of an Israeli university	RCT (within subject design) n = 171 and 247	Findings demonstrate that the effect of feedback on motivation and performance is moderated by task type. Some tasks (e.g., tasks requiring creativity) are perceived as promotion tasks, whereas others (e.g., those requiring vigilance and attention to detail) are perceived as prevention tasks. It was found that positive feedback increased (self-reported) motivation and actual performance among people working on promotion tasks, relative to negative feedback (H1). Positive feedback, however, decreased motivation and performance among individuals working on prevention tasks, relative to negative feedback (H2).	H1: motivation d = .43 H1: performance d =.67 H2: motivation d = -.33 H2: performance d =-.37	no serious weaknesses	A
Gjedrem, 2018	Students of the Business School at the University of Stavanger in Norway	RCT, n=221	Findings suggest that average performance rise when feedback is provided (H1a, H1b). However, this relationship between feedback and performance may depend on feedback environment (high vs low competitive), perceived ability to solve a task, and direction of the feedback (positive vs negative). Participants who were ranked relative to the performance of many subjects in the past (low competitiveness, CPF), performed better* when the feedback they received was negative (H3a), or when their perceived ability to solve the task was high (H2a); contrarily, when they perceived their ability as low, their performance was worse* (H2a). Participants who were compared to the three participants working alongside themselves (high competitiveness) performed better* when their perceived ability to solve the task was high (H2b ns) or when the feedback they received was positive (H3b ns). * comparing to the baseline group (APF), in which participants received simple feedback on their performance (number of solved tasks and a graph).	not reported	no serious weaknesses	A

Holderness, 2018	Undergraduate students from an introductory business course at a large Midwestern university	Controlled before-after study, n=52	Results suggest that when providing negative performance feedback, the effect of feedback source on performance is moderated by the level of psychological entitlement (i.e., a pervasive sense that one deserves more and is entitled to more than others) of the feedback recipient. Specifically, psychological entitlement moderates the effectiveness of negative feedback from a peer-level source such that performance improvement decreases as the level of psychological entitlement increases (H1), and from the superior-level source such that performance improvement increases as the level of psychological entitlement increases. (Note: Psychological entitlement and source level do not affect responses to positive feedback.)	not reported	no serious weaknesses	A
Ilies, 2010	Undergraduate students from a large public university	Longitudinal study, n=493	Both, emotions and self-efficacy play important roles in the goal-setting process, that is, emotional reactions to feedback influenced future goals and this effect was realized primarily through task (exam) self-efficacy. Positive (but not negative) emotional reactions demonstrate some additional direct effect on future goals.	see table in paper	Not a workplace setting (domain of education)	C
Jaakson, 2019	Students at masters' courses in business strategy in four universities in Finland, Russia, Estonia and Latvia	Longitudinal study, n=71	Relatively high levels of initial trust did not change over the period of the teams' projects in general, but in teams where feedback on performance was negative, both trust and trustworthiness declined significantly. Trust had a small mediating effect between group performances in two consecutive measurement points, meaning that past performance had an impact on trust, which in turn impacted the teams' next performance. However, no mediating effect was present between individual and team performance.	Individual performance & VT performance: $\beta=.16$ Direct effect of Week 4 VT performance on Week 8 VT performance: $\beta=.48$ Trustworthiness mediation effect: $\beta=.18$ Indirect effect of VT past performance: $\beta=.18$	no serious limitations	C

Jawahar, 2010	Employees of a software company located in the West Coast of United States	Longitudinal study, n=256	<p>Findings demonstrate that ratees' reactions to feedback mediate the influence of feedback-related characteristics on performance (H8). Moreover, perceived accuracy and satisfaction with received feedback, influence ratees' performance (H7a, H7c). Surprisingly, perceived utility was not significantly related to performance (H7b).</p> <p>Feedback characteristics, which were found to be associated with positive ratees' reactions to feedback are: rater's job knowledge: related to perceptions of accuracy (H1a), perceptions of utility (H1b), and satisfaction with feedback (H1c); rater's criticism: related to perceptions of accuracy (H2a), and perceptions of utility (H2b); job-relatedness of criteria: related to perceptions of accuracy (H4a), perceptions of utility (H4b), and satisfaction with feedback (H4c); goal-setting: related to perceptions of accuracy (H5a), perceptions of utility (H5b), and satisfaction with feedback (H5c) and suggesting ways to improve performance: related to perceptions of utility (H6b), and satisfaction with feedback (H6c).</p> <p>No association was found for rater's criticism and satisfaction with feedback (H2c); for the opportunity to participate in feedback discussion perceived accuracy (H3a), perceived utility (H3b), satisfaction with feedback (H3c), and for suggesting ways to improve performance with perceived utility (H6c).</p>	<p>H1 (a): $\beta=.11$, (b): $\beta=.14$, (c): $\beta=.30$,</p> <p>H2 (a): $\beta=-.16$, (b): $\beta=.12$, (c): ns</p> <p>H3 (a): ns (b): ns (c): ns</p> <p>H4 (a): $\beta=.55$, (b): $\beta=.23$, (c): $\beta=.22$,</p> <p>H5 (a): $\beta=.24$, (b): $\beta=.17$, (c): $\beta=.30$,</p> <p>H6 (a): ns (b): $\beta=.38$, (c): $\beta=.22$,</p> <p>H7 (a): $\beta=.61$, (b): ns (c): $\beta=.22$,</p>	no serious weaknesses	C
Johnson, 2015	Undergraduate students at a Midwestern university in the United States.	RCT, n=75	Findings suggest that task related feedback improved performance relative to general feedback, however, no differences were found between supportive and critical types of feedback.	not reported	no serious limitations	A

Lam, 2002	Tellers in a large international bank in Hong Kong	Before-after study n = 329	<ol style="list-style-type: none"> 1. In the short run (i.e., less than 3 months), employees who had received negative performance appraisal feedback did not report lower perceptions of organisational justice, organisational commitment, or job satisfaction or higher propensities to leave the organisation. 2. In the short run (i.e., less than 3 months), employees who had received positive performance appraisal feedback did report increased perceptions of organisational justice, organisational commitment, and job satisfaction and lower propensities to leave the organisation. 3. In the long run (i.e., more than 3 months), the initial improvement in perceived organisational justice and job-related attitudes was maintained by employees with good performance appraisal results and with low NA (=personality trait: the tendency to focus on the negative side of others and being less satisfied yourself and your life); however, perceived organisational justice and job-rated attitudes returned to baseline levels among those with high NA. To sum up, trait NA was found to moderate the attitudinal effects of positive performance feedback on employees' reactions. 	not reported	no serious limitations	C
Loftus, 2018	Undergraduate business students from a large, public state university.	RCT, (2x2 between-subject experimental design), n=108	Results indicate that employees' cognitive processes and reactions to performance feedback are influenced by the language used in explanations. Specifically, in the case where initial relative performance is low, the high use of causal language in the resulting negative performance feedback leads to a greater improvement in subsequent performance, compared to low use of causal language (H1). On the contrary, when initial relative performance is high, greater use of causal language in delivering positive feedback results in a smaller improvement in performance (H2).	H1: $d=0.27$, 95%CI (-0.26; 0.80) H2: $d=1.18$ 95%CI (0.34; 2.01)	Not all effect sizes were reported	A
Murthy, 2011	Undergraduate students at a large university in the Southeastern United State	RCT (3x4x2 factorial experimental design) n=289	Results revealed a significant positive effect of providing relative performance feedback (H1) and positively framed feedback on performance (H2a); the effect of negatively framed feedback on performance (H2b) was not found. The results also indicate an interaction between worker performance level and feedback framing, such that low-performing workers improved performance in response to positive feedback significantly more than average and high-performing workers (H3).	not reported	no serious weaknesses	A

Palmer, 2015	Participants from the Psychology Department subject pool at a Midwestern university in the US.	RCT, n=56	<p>NOTE: Study 1 was excluded, sample size too small (n =3)</p> <p>Results show that accurate and exaggerated objective performance feedback is better than no feedback and underreported feedback: accurate and tripled (= exaggerated) feedback significantly improved performance over the control and low-inaccurate feedback groups. Performance feedback may have reduced time off-task across all three feedback conditions (accurate, tripled and low-inaccurate) compared to the control.</p>	Effect of the different types of feedback on performance after initial first-session: $\eta^2=.17$	no serious weaknesses	A
Raver, 2012	Undergraduate students enrolled in a business course at a Mid-Atlantic US university	<p>RCT, Study 1: n=235</p> <p>Study 2: n=105</p>	<p>Findings suggest that highly competitive people outperform low-competitiveness people when criticized constructively, yet low-competitiveness people performed better than highly competitive people when they received destructive criticism (H4). Moreover, working harder intentions are higher when highly competitive people receive destructive criticism (H3).</p> <p>Regarding to reactions to feedback: Participants who experience destructive criticism are more likely to perceive that the offender intended to harm them (H1a), more likely to blame the offender for any harm experienced (H1b), and less likely to trust the offender than participants who receive constructive criticism (H1c). Participants who experience destructive criticism are more likely than participants who receive constructive criticism to report high levels of state anger (H2).</p>	<p>H1 (a): $\eta^2=.22$ (b): $\eta^2=.17$ (c): $\eta^2=.15$</p> <p>H2: $\eta^2=.26$</p> <p>H3: $\eta^2=.04$</p> <p>H4: $\eta^2=.06$</p>	no serious weaknesses	A
Raemdonck, 2013	Secretarial employees of 12 Dutch organisations	<p>RCT (2x2x2 factorial experimental design), n = 173</p>	<p>The findings show that elaborated specific feedback is perceived as more adequate (PAF), leads to more willingness to improve (WI), a more positive affect (AF) and a more positive attribution (AT) as compared to concise general feedback (RQ1, H1a).</p> <p>Moreover, complex three-way interaction effects were found for educational level on affect and attribution, and for career phase on willingness to improve and affect (RQ2). Low-educated employees reacted more strongly to supervisor feedback. Employees in the late career phase were more oriented towards the content of the feedback than feedback sender status, whereas the latter was of more concern for employees in the early and middle career phase.</p>	<p>H1a:</p> <p>PAF: $\eta^2=.35$</p> <p>WI: $\eta^2=.11$</p> <p>AF: $\eta^2=.12$</p> <p>AT: $\eta^2=.19$</p> <p>H1b:ns</p>	no serious weaknesses	A

Schaerer, 2018	multinational organisation in the education sector	Cross-sectional study n = 173 managers and 566 employees	<p>Findings suggest that managers overestimate how accurately their feedback is perceived by their employees (Hypothesis 1). Managers generally anticipated that their feedback would be understood by their employees more negatively than employees actually understood.</p> <p>This gap between managers and employees is more pronounced when the feedback is negative than when it is positive (Hypothesis 2). When the feedback was negative, managers' anticipated feedback rating was significantly lower than what employees actually understood (2a). However, when the feedback was positive, managers' anticipated feedback rating was no longer statistically different from employees' actual understanding (2b).</p>	<p>H1: $\beta = 0.41$, $d = .35$</p> <p>H2a: $\beta = 1.05$, $d = .55$</p> <p>H2b: ns</p>	no serious weaknesses	D
Young, 2017	Part-time workers at Amazon's Mechanical Turk (Mturk, an online marketplace for work)	RCT, n=177	<p>Empathic leader providing feedback increased positive affect more than a non-empathic leader who in all other ways provided appropriate feedback.</p> <p>Leader empathic concern has an indirect effect on evaluations of the leader's feedback-giving effectiveness through positive and affective reactions to negative feedback.</p>	<p>H1a: $\eta^2 = .09$</p> <p>H1b (NS): $\eta^2 = .01$</p> <p>H3a: $\beta = .45$</p> <p>H3b: $\beta = -.30$</p>	no serious weaknesses	A



Excluded studies

Author & year	Reason for exclusion
Akin, 2017	Not a workplace setting (computerised experiment with students).
Azmat, 2009	Not a workplace setting (high school students).





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