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THE EFFECT OF NEGATIVE FEEDBACK ON MOTIVATION: A META-ANALYTIC INVESTIGATION

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A META-ANALYTIC INVESTIGATION

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The Effect of Negative Feedback on Motivation:
A Meta-Analytic Investigation

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Although the most prominent view in psychological theory has been that negative feedback should generally have a detrimental impact on motivation, competing perspectives and caveats on this prominent view have suggested that negative feedback may sometimes have neutral or even positive effects on motivation. A meta-analysis of 79 studies examined the effect of negative feedback on motivation and related outcomes with both child and adult samples. Results indicated that negative feedback compared to positive feedback decreased intrinsic motivation and perceived competence. This effect is much smaller when compared to neutral or no feedback. Moderator tests revealed that the effect of negative feedback seems to be less demotivating when a) the feedback statement includes instructional details to improve, b) compared to objective versus normative standards, and c) the task is interesting. Implications for future research and applications to real-world settings are discussed.

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Chapter One: Introduction

"Criticism may not be agreeable, but it is necessary. It fulfills the same function as pain in the human body. It calls attention to an unhealthy state of things." - Winston Churchill

On the whole, negative feedback is believed to be an unavoidable practice when providing a performance evaluation, in spite of its often ego-threatening consequences. Ilgen and Davis (2000) argued that "few beliefs are more widely accepted by psychologists, managers, educators, and others concerned with human performance than the belief that people need to receive feedback about how well they are performing their tasks/jobs" (p. 550-551). However, these theorists and others view negative feedback as a "conundrum" or a "dilemma" (Van Dijk & Kluger, 2004). In the classroom, giving information that highlights mistakes or shortcomings in a student's work can simultaneously instruct the student towards greater gains in learning yet undermine motivation and self-confidence in academics (Cohen, Steele, & Ross, 1999). Teachers, mentors, parents, employers, and coaches often struggle to provide negative feedback in a motivating or instructional way (Cohen, Steele, & Ross, 1999; Sansone, Sachau, & Weir, 1989). Overall, providing feedback is an integral part of the teaching process (Hattie & Timperley, 2007), athletic and sports training (Mouratidis, Lens, & Vansteenkiste, 2010), and the employment sector (Baron, 1988b). Given the importance of feedback across a

variety of contexts, it is critical that scholars and practitioners have a clear understanding of how negative feedback can affect motivation, and if, when, and how it should be given.

Motivation theorists have suggested that negative feedback has an overall negative effect on motivation—the process that gives behavior its energy and direction (Reeve, 2009a). That is, negative feedback may undermine people's experience of wanting to engage in or persist at a task broadly, or even more specific forms of motivation such as wanting to persist at a task out of interest, enjoyment, or some inherent satisfaction that engaging in the task brings about (e.g., intrinsic motivation). Signaling incompetence, negative feedback can undermine one's perceptions of success and thereby one's interest in engaging in the task. Analyzing the effects of positive feedback or praise on intrinsic motivation, two research syntheses (see Deci, Koestner, & Ryan, 1999; Henderlong & Lepper, 2002) showed that overall, positive feedback enhances intrinsic motivation as it provides an affirmation of one's sense of competence. However, a synthesis on the influence of negative feedback on motivation has yet to be conducted, despite 40 years of research having accumulated on the topic. In fact, mixed evidence regarding the effect of negative feedback on motivation (Anderson & Rodin, 1989; Bracken, Jeffres, & Neuendorf, 2004; Comer, 2007; Deci, 1972; Deci & Cascio, 1972; Elliot et al., 2000; Goudas & Minardou, 2000; Marsden, 1998; Shanab, Peterson, Dargahi, & Deroian, 1981) has led to uncertainty regarding both the direction and magnitude of its effect, making a meta-analysis of the topic particularly timely. In line with this sentiment, Van-Dijk and Kluger (2004) stated "despite our common sense

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notion that indicates that feedback sign (positive vs. negative) has a decisive effect on motivation, the vast literature has no clear specifications when and how positive (negative) feedback increases or decreases motivation" (p. 113).

The present study was a meta-analysis to address this lack of clarity in this research area and to contribute to a more nuanced understanding of the effect of negative feedback on motivation. Given that motivation is both a desirable outcome in its own right, as well as a factor that has been linked with other adaptive outcomes such as improved learning, performance, and well-being (e.g. Deci & Ryan, 2008; Flavell, 1999; Grolnick, Ryan, & Deci, 1991; Niemiec & Ryan, 2009; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), a meta-analysis synthesizing the effect of negative feedback on motivation may also be valuable for the recommendations it can provide practitioners hoping to enhance motivation across a variety of contexts.

In the present dissertation, I synthesized over forty years of accumulated research on the effects of negative feedback on motivation using meta-analysis. In the following sections, I discuss the theoretical rationale for my meta-analytic investigation and outline the approach to synthesizing research studies.

Chapter Two: Literature Review

DEFINING FEEDBACK

Feedback is generally understood as the numerous procedures that are used to tell a learner if a response is right or wrong (Kulhavy, 1977). Feedback is inherently a response to one's performance or understanding (Hattie & Timperley, 2007). Many factors need to be taken into consideration in giving and receiving feedback: the effect of a feedback intervention on subsequent cognition and behavior is influenced by the characteristics of the evaluator, feedback message, and receiver (Ilgen, Fisher, & Taylor, 1979).

Feedback has been theorized to occur on four different levels: feedback about the task, the process, the self-regulation, and the self (Hattie & Timperley, 2007). First, feedback at the task level indicates whether work is correct or incorrect and may or may not provide information on how to acquire correct information (e.g., "You have not included enough detail on this topic"). Second, feedback at the process level refers to the learning process required to complete the task or for greater understanding (e.g., "You have not used the strategies we talked about regarding how to include descriptive adjectives in a paper"). Third, at the self-regulation level, feedback targets greater skill in self-evaluation or self-efficacy to persist in a task (e.g., "I can tell that you did not check over your work. For every event you discuss in your paper, monitor if there is enough description"). Lastly, feedback at the self level informs a personal sense of value (e.g.,

"You are a bad writer"). Either negative or positive feedback can occur at each of these four levels.

Feedback can vary in valence (Kulhavy, 1977). Some feedback may communicate positive qualities about a product, action, or person. Alternatively, feedback may communicate neutral or negative qualities. Conceptually, feedback valence refers to the perceived value of the information conveyed within the message content (Cusella, 1982). In a review of the effect of praise on intrinsic motivation, Henderlong and Lepper (2002) defined praise as the "positive evaluations made by a person of another's products, performances, or attributes, where the evaluator presumes the validity of the standards on which the evaluation is based" (Kanouse, Gumpert, & Canavan-Gumpert, 1981, p. 98). For this meta-analysis, I defined negative feedback as the negative counterpart to this definition. That is, negative feedback is an evaluation made by a person of another's products, performances, or attributes that expresses some lack of mastery, undesirable qualities, or areas for improvement, where the evaluator presumes the validity of the standards on which the evaluation is based. Criticism, a related term and particular form of negative feedback, refers to an analysis and judgment of both merits and faults of some performance, product, or person. Because the definition of the term *criticism* implies that an extensive analysis will be conveyed and that both positive and negative evaluation may be included, I generally used the term *negative feedback* throughout this paper. However, I acknowledge that negative feedback that contains a great deal of information and analysis may be better described as *criticism*.

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THE ROLE OF FEEDBACK IN MOTIVATION

Psychological theories as early as behaviorism and Thorndike's Law of Effect (1927) have examined the importance of feedback, or knowledge of results, on human behavior. Thorndike defined positive feedback as reinforcement and negative feedback as punishment, with the former intervention aimed at increasing desirable behavior and the latter aimed at extinguishing undesirable behavior. In addition to its role in behavior modification, feedback is believed to be a significant factor in motivation (e.g., Lepper & Chabay, 1985). Feedback is an essential factor in many motivation and learning theories.

Common sense would suggest that one of the most important characteristics of feedback's effects is its valence or sign (i.e., positive or negative). However, research has shown inconsistent results regarding the valence of feedback on performance (Hattie & Timperley, 2007; Kluger & Denisi, 1996). In a meta-analysis of 596 effect sizes examining the feedback-performance relationship, Kluger and Denisi found that there was no difference in the effect of positive versus negative feedback on performance, and that both had a positive effect on performance.

In the same vein, debate exists regarding the role of valence in explaining the relation between feedback and motivation. Scholars generally agree that positive feedback will have beneficial effects on motivation (Deci et al., 1999), self-efficacy (Bandura, 1997), and positive affect (Kluger & Denisi, 1996), especially when it addresses the feedback receiver's product or process used to complete the task versus characteristics of the self, including ability (Mueller & Dweck, 1998; Kamins & Dweck, 1999), and when it is perceived to be sincere and authentic (Henderlong & Lepper, 2002).

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However, it is not clear as to whether negative feedback increases or decreases motivation (Van-Dijk & Kluger, 2004). Although some studies have found that receiving negative feedback decreases intrinsic motivation (Deci, 1972; Deci & Cascio, 1972; Elliot et al., 2000; Goudas & Minardou, 2000; Marsden, 1998), other studies have suggested that receiving negative feedback increases motivation or has no effect on motivation altogether (Anderson & Rodin, 1989; Bracken, Jeffres, & Neuendorf, 2004; Comer, 2007; Shanab, Peterson, Dargahi, & Deroian, 1981). In line with the mixed evidence in the empirical literature, theoretical perspectives have also been conflicted in their predictions regarding the nature of the effect of negative feedback on motivation. A review of these theoretical perspectives follows next.

TWO CONTRASTING VIEWS: NEGATIVE FEEDBACK UNDERMINES OR ENHANCES INTRINSIC MOTIVATION

The following section highlights two contrasting views that negative feedback may either enhance or undermine intrinsic motivation. Two theories generally suggest that on average, negative feedback decreases motivation: Self-determination theory (SDT; Deci & Ryan 1985; Ryan & Deci, 2000) and social cognitive theory (SCT; Bandura, 1986). On the other hand, three other theories suggest that negative feedback will increase motivation: Information processing theory (Mayer, 1996), control theory (Carver & Scheir, 1982), and goal-setting theory (Locke & Latham, 1990). All of these theories generally acknowledge that there are factors that can make the effects of negative feedback more detrimental or more beneficial; however, when these factors are

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not taken into consideration, the prediction regarding the overall effect of negative

feedback on motivation varies depending on the theoretical framework.

Negative Feedback Undermines Motivation

The prominent view among researchers, educators, and parents is that negative

feedback decreases motivation (e.g., Deci, 1971; Elliot et al., 2000). Ilgen and Davis

(2000) suggested that in spite of the best intentions to improve subsequent performance,

negative feedback may most typically produce the opposite intended effect.

Fundamentally, negative feedback's deleterious effects can be explained by its

necessarily evaluative nature towards the self. Henderlong and Lepper (2002) argued

that being evaluated can engender a contingent sense of worth that can lead to self-

consciousness which distracts from the task at hand (Baumeister et al., 1990) or creates a

sense of helplessness (Kamins & Dweck, 1999). Elliot et al. (2000) discussed

individuals' tendency toward self-enhancement, or the desire to elevate one's self-

concept and protect the self from negative evaluation, is essentially axiomatic across

phenomena in the social and personality psychology literature. Individuals are concerned

with the valence of the task outcome being evaluated and the implications for the self

(positive beliefs about self are enhanced or diminished when positive versus negative

information is presented, respectively). As a result of this unequivocal tendency towards

self-enhancement, information that communicates task success, high ability, and positive

personality attributes are regarded as more attractive than information that communicates

failure, low ability, and negative attributes (Taylor & Brown, 1988). To the extent that

negative feedback is a threat to the self and self-enhancement is a central motivator of behavior, receiving negative feedback is presumed to be demotivating.

Self-Determination Theory (SDT; Deci, 1980; Ryan & Deci, 2000) provides one of the most comprehensive frameworks for understanding how feedback influences motivation, and in particular, internal forms of motivation such as intrinsic motivation. Intrinsic motivation (IM) is defined as the propensity to engage in a task out of interest or enjoyment, for its own sake, or without any external incentive or reward (e.g., Deci, 1971; Deci & Cascio, 1972; Deci & Ryan, 2000; Vallerand & Reid, 1981). It contrasts with extrinsic motivation, which refers to engagement motivated by external pressures or influences. In particular, a sub-theory of SDT, cognitive evaluation theory, posits that three fundamental needs underlie intrinsic motivation: competence, autonomy, and relatedness (Deci & Ryan, 1980; Ryan & Deci, 2000). Competence refers to perceived effectiveness in dealing with the environment in which a person is situated (Niemiec & Ryan, 2009). Autonomy is the sense that one is the origin of his or her own actions (Ryan & Grolnick, 1986). Relatedness, also referred to as belongingness (Baumeister & Leary, 1995), is the experience of being connected with and engaging in mutual care with others (Hutman, Konieczna, Kerner, Armstrong, & Fitzpatrick, 2012; Niemiec & Ryan, 2009; Ryan & Deci, 2000). Social contexts that satisfy these needs will enhance intrinsic motivation (Ryan & Deci, 2008). Likewise, conditions that thwart satisfaction of these needs will diminish intrinsic motivation (Niemiec & Ryan, 2009; Reeve & Jang, 2006). Understood as a vital motivational process, feedback may be one of the primary ways of supporting or diminishing intrinsic motivation. In fact, feedback would seem to be

particularly powerful because it is expected to influence the extent to which all three psychological needs are satisfied, and especially the needs for autonomy and competence (e.g., Deci, 1971).

Negative feedback and the need for competence

Because one's understanding of one's own competence is often determined by evaluative information or feedback given to an individual, SDT posits that negative feedback will decrease one's sense of competence (Deci, 1971; Deci & Cascio, 1972; Elliot et al., 2000), and therefore, one's level of intrinsic motivation in a task. Deci (1971) and other have argued that receiving negative feedback causes an association of negative value with failure and a resulting threat to the person's sense of competence (de Charms, 1968; Vallerand & Reid, 1984). Deci and Cascio (1972) supported this notion, demonstrating that negative feedback, in the form of an aversive buzzer for an incorrect response, diminished participants' perceived competence and intrinsic motivation for an interesting Soma puzzle task (creating images out of a configuration of smaller shapes). It is worth noting that negative feedback diminished intrinsic motivation despite the inherent interestingness and positive value associated with the activity itself. In another experimental study, Vallerand and Reid (1984) manipulated feedback by making verbal comments to subjects suggesting that they were doing either well or poorly. The results indicated that success feedback led to enhanced intrinsic motivation whereas failure feedback reduced it. Thus, SDT would suggest that negative feedback undermines intrinsic motivation when it implies task incompetence (Deci & Ryan, 1985).

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The effect of feedback on intrinsic motivation is not only mediated by perceived competence but also by competence valuation (Elliot & Harackiewicz, 1994), which refers to the degree to which a person cares about doing well at a certain activity (Harackiewicz & Manderlink, 1984). Research has shown that feedback influences both of these competence-related constructs separately (Harackiewicz & Sansone, 1991), as two different pathways through which intrinsic motivation is affected. Essentially, the knowledge that one is competent and the desire to be competent are understood as separate paths through which feedback influences intrinsic motivation (Elliot et al., 2000). Regarding competence valuation, Sansone (1986) argued that negative feedback could greatly influence competence valuation as it represents a person's strategic divestment from the pursuit of competence. To protect one's self-esteem, a person may believe that performing well is not important following failure and subsequent negative feedback. Elliot et al. (2000) described this process as important to changes in intrinsic motivation, citing how decreasing one's investment in competent performance should decrease intrinsic motivation (Elliot & Haracakiewicz, 1994; Reeve & Deci, 1996; Sansone, 1989). In their study, Elliot et al. (2000) manipulated the valence of feedback on a laboratory task and measured competence valuation, perceived competence, and IM. They found that compared to positive feedback, negative feedback decreased both competence valuation and perceived competence, which in turn, undermined IM.

Despite SDT's theoretical prediction that negative feedback will generally undermine IM because of its detrimental effect on competence beliefs, not all negative feedback is expected to diminish competence beliefs. Self-determination researchers

describe competence-supportive or *effectance-relevant* feedback as including some praise and *informational* feedback, or providing information on how one can improve in the task (Ryan, Mims, & Koestner, 1983). Informational feedback or effectance-relevant feedback provides "behaviorally relevant information in the absence of pressure for a particular outcome" (p. 451, Ryan, 1982) and has been shown to increase intrinsic motivation (Deci, Ryan, & Koestner, 1999; Pittman, Davey, Alafat, Wetherill, & Kramer, 1980). However, the informational aspect of feedback has been primarily studied with verbal rewards or praise, and little is known about informational negative feedback. Theoretically, providing information on how to improve may buffer the competence-reducing effects of negative feedback; this issue is discussed in greater detail in the section on factors that influence the effect of negative feedback on motivation.

Social Cognitive Theory

The importance of perceived competence in response to negative feedback is underscored by Social Cognitive Theory (Bandura, 1977). Similar to perceived competence, self-efficacy as defined by Bandura (1997) is the belief that one is capable of performing in a certain manner to attain certain goals. Bandura outlined four sources of information from which a sense of self-efficacy is constructed, including mastery and vicarious experiences, physiological responses, and social persuasion. In regards to feedback, the most relevant source of self-efficacy is social or verbal persuasions. Verbal persuasion from peers, teachers, or parents can strengthen or weaken a learner's self-efficacy beliefs (Bandura, 1986). Especially when individuals are not ready to make

accurate self-appraisals, evaluative feedback informs judgments about task performance and one's perceived competence in that task (Usher & Pajares, 2008). Bandura (1997) argued that it is easier to undermine self-efficacy through verbal persuasions than to enhance it, suggesting that negative feedback may have a particularly powerful negative influence on self-efficacy and motivation. Research has supported this assertion. For example, participants who received negative feedback from supervisors in a work situation reported lower self-efficacy compared to participants who received positive feedback (Baron, 1988b).

All in all, SDT and SCT would suggest that negative feedback may have an undesirable effect on motivation to the extent that it communicates that one is incompetent and diminishes the value for being competent. Moreover, providing competence-supportive feedback involves the inclusion of praise and direction that can inform how to enhance subsequent competence.

Negative feedback and the need for autonomy

One's need for autonomy may also be influenced when receiving negative feedback. Negative feedback may diminish intrinsic motivation to the extent that people often perceive that feedback is based on things that are out of their control. Henderlong and Lepper (2002) suggested that feedback may inherently call attention to the controlling behavior of evaluators, thereby shifting an individual's perceived locus of causality from being more internal to more external and dampening intrinsic motivation. That is, feedback may be perceived as controlling and reduce one's sense of autonomy if

individuals believe they are engaging in a behavior only to meet some externally imposed (not self-endorsed) standard and receive positive feedback or avoid negative feedback in that effort. Therefore, to the extent that negative feedback is experienced as an attempt of the evaluator to control the individual's behavior, it will undermine autonomy and intrinsic motivation. Nevertheless, debate exists regarding the extent to which negative feedback is experienced as controlling and influences individuals' experience of autonomy (Ryan, 1982). Some research indicates that receiving positive performance feedback enhances feelings of autonomy (Gagne, Senecal, & Koestner, 1997; Hackman & Oldham, 1975); whereas other researchers argue that feedback affects intrinsic motivation solely via competence needs (Deci & Ryan, 1985).

That said, the possible influence of feedback on autonomy suggests a factor that might mitigate detrimental effects of negative feedback. When negative feedback is delivered in an autonomy-supportive manner, it should have more desirable effects. With the research on autonomy-supportive environments and practices (e.g., Reeve & Jang, 2006; Reeve, Jang, Carrell, Jeon, & Barch, 2004) as a guide, feedback that includes non-controlling language, acknowledgement of negative emotions, and private delivery (as opposed to public delivery; Ames, 1992) may buffer maladaptive effects of negative feedback because feedback will be less likely to be experienced as controlling one's behavior. When individuals receive autonomy-supportive feedback, it is predicted that they will perceive a greater internal locus of causality for their subsequent performance (Reeve & Jang, 2006). Empirical evidence has supported this notion: Anderson and Rodin (2010) compared receiving feedback in either controlling or autonomy-supportive

contexts and found that in the context of an autonomy-supportive environment, students reported experiencing greater flexibility in how to reengage in a task and less pressure towards learning and enhanced intrinsic motivation. In a survey study, Mouratidis, Lens, and Vansteenkiste (2010) measured the autonomy-supportive or controlling communicative style when providing feedback to athletes about their sports performance. They found that athletes who accepted the corrective (negative) yet autonomy-supportive feedback were more intrinsically motivated for persisting in an athletic task compared to students who received feedback with controlling language.

All in all, it seems likely that negative feedback may generally diminish one's sense of autonomy and subsequent intrinsic motivation. However, feedback that is autonomy supportive is likely to be less detrimental and more supportive of intrinsic motivation.

Negative feedback and the need for relatedness

Feedback may also influence intrinsic motivation through its impact on the need for relatedness. Negative feedback may be experienced as an expression of being uncaring and thus diminishes relatedness, which in turn diminishes intrinsic motivation. Research indicates that providing positive feedback through compliments, praise, or approval was perceived as an indicator of high relatedness (Hutman et al., 2012). Praise enhances relatedness because it increases value about someone else's ideas or work. Conversely, individuals may like others less and feel less connected with others who give them negative information about their products or personal attributes. This highlights the

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possibility that feedback can be delivered in ways that support relatedness to a greater or lesser extent and thus support or thwart intrinsic motivation to a greater or lesser extent. Specifically, relatedness-supportive feedback that communicates a sense of investment on behalf of the feedback giver enhances relatedness because there is interest of the feedback receiver expressed (Noddings, 2002; Ryan & Deci, 2008). Negative feedback that communicates this investment is likely to support feelings of relatedness, mitigating detrimental effects on intrinsic motivation or even enhancing it (see Sheldon & Filak, 2008).

Likewise, the extent to which an individual's need for relatedness is satisfied by the relationship with their feedback provider may influence the way negative feedback is given and experienced (Comer, 2007). That is, feedback is more likely to be more charitable and to include positive information when a high level of relatedness characterizes the relationship (Kumashiro & Sedikides, 2005; Sarason, Sarason, & Pierce, 1990; Sedikides, Campbell, Reeder, & Elliot, 2002). On the other hand, when the relationship is characterized by low relatedness, feedback is more accurately provided but less sensitive to feedback receivers. With this in mind, it seems likely that negative feedback may have a less detrimental and even beneficial effect on intrinsic motivation when the relationship between feedback receiver and giver is characterized by high relatedness.

Overall, SDT posits that negative feedback will undermine a sense of relatedness between the feedback receiver and giver, and in turn, lower the feedback receiver's intrinsic motivation. However, relatedness-supportive feedback, which fosters

acceptance and inclusion of the feedback receiver, may buffer the undermining effect of negative feedback on intrinsic motivation.

Negative Feedback Enhances Motivation

The contrasting view that negative feedback enhances motivation has been suggested by researchers focused on the motivating influence of goal discrepancy (control theory, Carver & Scheier, 1982; goal setting theory, Locke & Latham, 1990) and by constructivist theorists who see feedback as an essential and motivating aspect for information processing.

Control theory and goal-setting theory

Control theory, a model of self-regulation, assumes that behavior is regulated through a negative feedback loop in which perceived discrepancies between one's present state and a desirable reference value motivates an individual to reduce such deviations (Carver & Scheier, 1982; 1990; Hyland, 1988). The feedback loop first receives an input function, which senses the present condition. Then, this perception is compared to a point of reference through an entity called the comparator. An output function or behavior is then performed to reduce any discrepancy highlighted by the comparator. Control theory predicts that negative feedback enhances motivation because negative feedback essentially begins the negative feedback loop (Hyland, 1988). The perception of negative feedback is an input function that gets compared against some standard that the negative feedback is based upon. As a result, the output function is the motivated

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behavior that will attempt to reduce the discrepancy that the negative feedback highlighted. Carver and Scheier discussed informational feedback as a particularly important component of the feedback loop and argued that it is an essential aspect to self-regulation (p. 124, 1981).

Arguing that discrepancy reduction is a consequence rather than a cause of goal-directed behavior, goal theorists posit that people need feedback that reveals progress in relation to their goals (Locke & Latham, 1991; 2002). When people set goals, goal discrepancies between what they do and what they wish to achieve is often signaled by negative feedback; in response, self-dissatisfactions are created and serve as motivational inducements for greater effort (Bandura & Cervone, 1983). Without such formative evaluation, individuals cannot adjust the level or direction of their effort to achieve their goal. If negative feedback signals not achieving a goal, it will motivate an individual to re-engage in a task and attempt to perform at a higher level to reach the original goal. When individuals find they are below target, they normally increase their effort (Matsui, Okada, & Inoshita, 1983) or try a new strategy. That is, negative feedback may motivate individuals to exert more effort due to their desire to keep congruence between their goals and behaviors (Ilgen, Fisher, & Taylor, 1979).

The provision of explicit challenging goals enhancing performance motivation is well established in the literature (Ilgen, Fisher, & Taylor, 1979; Locke, Shaw, Saari, & Latham, 1981). However, research also indicates that feedback is a moderator of the effect of goals on performance such that the combination of goals plus feedback is more effective than goals alone (Bandura & Cervone, 1983; Becker, 1978; Strang, Lawrence,

& Fowler, 1978).   In an experimental investigation, Bandura and Cervone (1983) compared four conditions of feedback and goal combinations. After performing a strenuous task, participants received one of four conditions: feedback and goals, goals alone, feedback alone, and control condition. They found that combining goals with feedback was the strongest motivator and that feedback or goals alone led to no change in motivation.

Information processing theory

Although self-determination theory and social cognitive theory propose that negative feedback will be likely to decrease one's perception of competence, an information processing perspective (Mayer, 2009) presents an alternative theoretical perspective regarding the effects of feedback on competence.   According to the information processing perspective, feedback is information for learners to make cognitive, behavioral, or motivational modifications (Anderson, Kulhavy, & Andre, 1972; Bruning, Schraw & Ronning, 1999; Narciss, 2004).   Thus, errors are not only expected for learning but are also useful in judging one's level of understanding and becoming aware of misconceptions. Kulhavy (1977) argued that feedback is not merely a behavioral reinforcer with the power to initiate action, but a source of instruction and initiator of a learning process in which feedback must be interpreted and can be accepted, modified, or rejected. That is, negative feedback provides an opportunity to correct mistakes and may even provide instruction related to the task or process of learning, filling a gap between what is understood and what is aimed to be understood (Sadler,

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1989). Winne and Butler (1994) summarized "feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies" (p. 5740). Therefore, this corrective element to negative feedback can be processed as information that can be used to enhance performance, and in turn, it may increase a sense of perceived competence and thereby, motivation (Richards, 1991).

In fact, there is some evidence to support this assertion. In an experimental investigation with undergraduate students, Richards (1991) found that constructive or informational negative feedback conveyed a belief that improvement was possible, ultimately circumventing the theorized deleterious effects of negative feedback on perceptions of competence and motivation. Participants who received constructive negative feedback reported greater IM in the task compared to those who received negative feedback without an informational component.

In summary, from goal and information processing perspectives, it is expected that merely understanding what the standard of excellence is in order to focus one's energy appropriately in the future can be a strong motivator (Henderlong & Lepper, 2002; Yeager et al., 2014). Knowledge of standards can highlight where improvement may be needed and increase the feedback recipient's perception of control and desire to reach that standard. That said, it should be noted that although the various theoretical perspectives disagree about the nature of the average effect of negative feedback, there is agreement on the prediction that negative feedback that contains an instructional or

informational quality will be more beneficial compared to negative feedback that contains little information that a feedback receiver could use to improve future performance.

Summary of Theoretical Views on Feedback

Although the most prominent view in psychological theory has been that negative feedback should generally have a detrimental impact on motivation (Bandura, 1997; Baumeister et al., 1990; Deci, 1971; Elliot et al., 2000), competing perspectives (Carver & Scheir, 1981; Locke & Latham, 1991; Kulhavy & Stock, 1989) and caveats on this prominent view have suggested that negative feedback may at least sometimes have neutral or even positive effects on motivation. Some self-determination theorists have discussed negative feedback as an opportunity for the receiver to face a challenge, causing unchanged or possibly enhanced motivation (Deci & Cascio, 1972). This notion is in line with goal and control theorists who treat feedback as a necessary input to reach goals. In line with an information processing perspective, to the extent that negative feedback provides a mechanism for enhancing one's competence in the future, it might be expected that negative feedback, especially that which includes greater information and instructional value, may enhance motivation. Consistent across all theories is the notion that any detrimental motivational effects of negative feedback are likely to be mitigated when the feedback includes details about how to improve.

In sum, there is both empirical and theoretical evidence to support both views of the effect of negative feedback. In some cases, negative feedback may improve

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subsequent motivation, and in other cases, may be detrimental to motivation. In the following section, I will attempt to address additional factors that are likely to determine the conditions under which the effects of negative feedback on intrinsic motivation may vary.

FACTORS THAT INFLUENCE THE EFFECTS OF NEGATIVE FEEDBACK ON MOTIVATION

Conflicting theoretical perspectives and empirical evidence suggest that the relationship between negative feedback and motivation may be complex. It seems reasonable to expect that the effect of negative feedback on motivation may change depending on various circumstances. Characteristics of the feedback, task, evaluator, or feedback receiver are all theoretically relevant variations that may affect the magnitude or direction of the effect of negative feedback.

Characteristics of the Feedback

Both theory and empirical evidence point to aspects of the feedback statement that may moderate the effects of negative feedback on motivation. The following sections describe how various features of feedback may moderate the relationship.

Focus of feedback

According to Hattie and Timperley's (2007) model of feedback, the effects of negative feedback will vary depending on which level (or focus) the feedback occurs (task level, process level, self-regulation level, or self level). Specifically, they suggested that negative feedback had stronger detrimental effects on performance at the level of the

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self compared to the other levels. This pattern of effect has also been supported by praise research showing more positive effects of product versus person-centered praise (Corpus & Lepper, 2007; Kamins & Dweck, 1999). These prior findings suggest that the effect of negative feedback is likely to have a more detrimental effect on motivation when focused on the person compared to the task or process. Because one's self-concept is closely tied to a sense of perceived competence (Bong & Skaalvik, 2003), perhaps self-level negative feedback will more directly influence one's motivation compared to process-level feedback. Since self-level negative feedback diminishes perceived competence but does not provide much specific direction on how to improve one's performance of the process or task, such feedback is likely to be the least motivating according to all theoretical predictions. Further, Kluger and Denisi (1996) argued that task-motivation processes are most affected by self-regulation level feedback. A learner's self-regulation encompasses his or her learning goal, self-efficacy, and motivation to remain engaged in a task, so negative feedback regarding these learning components may have detrimental effects on motivation. As such, we might expect that negative feedback may also have more detrimental effects on motivation on when feedback targets the self-regulation level compared to the task and process level.

Quantity and intensity of feedback

The quantity of negative feedback may moderate its effect on motivation. Deci and Cascio (1972) suggested that the relationship between feedback—both negative and positive—and intrinsic motivation is not necessarily monotonic. For instance, small

doses of praise can increase one's sense of competence. But when there is excessive praise, the person may become ingratiated or dependent on the positive feedback as one would become dependent on an external incentive (e.g., money), which will undermine intrinsic motivation and increase a sense of being controlled and less autonomous. Conversely, too much negative feedback is ego-threatening whereas a very small amount may serve as information or a challenge, enhancing motivation (Deci, 1971).

The intensity of the feedback statement may also alter its effects on motivation. That is, the undermining effect of negative feedback on intrinsic motivation may be negligible when it is mild. There is some evidence to suggest this. For example, Anderson and Rodin (1989) examined the effects of mild negative feedback by providing normative feedback that suggested the participant's score on a puzzle task ranked slightly above 50th percentile. The negative feedback was considered mild to the extent that it indicated that the individual was still about average in their performance, despite still having some skills in need of improvement. They found that participants felt discouraged but did not perceive the feedback to be devastating to their perceived competence. Their study resulted in two important findings: first, moderately negative feedback undermined motivation less than highly negative feedback and had a positive effect on motivation compared to receiving no feedback. The first finding fits the view that the more negative the feedback, the less motivated the receiver will be. Goal theorists suggested that particularly harsh evaluations of markedly substandard performances can result in personal discouragement and goal abandonment (Bandura & Cervone, 1983). Rather, information indicating moderately discrepant performances is likely to spur goal pursuit.

The second finding fits the alternate view that negative feedback can increase motivation by providing an evaluation and thereby a mechanism for enhancing one's competence in the future.

Inclusion of praise

One common solution to the ego-threatening aspect of negative feedback is to include elements of praise (Yeager et al., 2014). This can boost self-esteem and lessen the detrimental effect of negative feedback (Brummelman, Thomaes, Overbeek, Orobio de Castro, Van den Hout, & Bushman, submitted; Cohen et al., 1999). Research analyzing the inclusion of praise in negative feedback was rated as highly motivating by pre-service teachers in a survey study (Fong & Schallert, 2012). Therefore, the inclusion of praise may positively affect the otherwise detrimental impact of negative feedback on motivation.

Social nature of feedback

One important dimension of social feedback is the mode in which feedback is delivered. Whether the feedback is delivered by spoken word (verbal), a nonverbal sound (e.g., a buzzer), in written form, a nonverbal visual sign (e.g., an X), or a combination of these modes may also influence its relationship with motivation. Comparing computer feedback with verbal feedback, Bracken et al. (2004) found that criticism in text form did not undermine motivation compared to verbal criticism. They theorized that in-person or verbal criticism may be perceived as too harsh and therefore,

less intrinsically motivating. According to SDT, research indicates that private delivery (only the participant knows the nature of the evaluation) when compared to public delivery (at least one other person knows about the evaluation) of feedback is more intrinsically motivating (Ames, 1992). When others are aware of the performance feedback, there can be greater external pressure and thus, a less internal locus of causality in the response to the feedback, which would ultimately undermine a sense of autonomy and motivation. Although few researchers have tested the differences in feedback mode in a single study, there are clearly theoretical reasons for believing that it is an important moderator.

Informational feedback

As previously discussed, the extent to which feedback incudes an informational competence may also moderate its effect on motivation. More specifically, giving informational feedback is a way to provide a nonthreatening evaluation when critiquing a person's work (Kilbourne, 1990). Informational feedback, also called formative feedback (Schute, 2008), corrective feedback (Hattie & Timperley, 2007), constructive feedback (Kilbourne, 1990), and effectance-relevant feedback (Deci & Ryan, 1985), is feedback geared towards the feedback receiver's improvement on a task. Constructive feedback has been defined as non-confrontational feedback that provides specific directions for improvement and is delivered with sensitivity about attributing blame (Baron, 1988b). In fact, research has suggested that negative yet corrective feedback at a task level is a powerful tool for enhancing learning as it provides information regarding

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what to do and how to respond in the future (Hattie & Timperley, 2007; Bangert-Drowns, Kulik, Kulik, & Morgram, 1991; Phye & Sanders, 1994; Schute, 2008).

In line with this, self-determination theory, social cognitive theory, and an information processing perspective would all predict that the detriments of negative feedback will be mitigated and the benefits enhanced when negative feedback includes a constructive component. That is, according to SDT, negative feedback that includes a greater informational component is likely to mitigate any implication of incompetence and convey a belief that improvement is possible, ultimately circumventing any of the deleterious effects of criticism on perceptions of competence and possibly even enhancing intrinsic motivation (Narciss, 2004; Richards, 1991). Likewise, according to social cognitive theory, verbal persuasions will bolster student effort and perceived competence when accompanied by conditions and instructions that help ensure future success, despite its potentially ego-threatening aspects (Evans, 1989). Finally, in line with an information processing perspective, to the extent that feedback is perceived as information useful for correcting mistakes and enhancing subsequent learning it should have a positive effect on motivation and performance (Richards, 1991). Goal and control theorists also suggest that greater information will enhance the positive effect of negative feedback on motivation. That said, even feedback that contains information varies in its level of specificity. Vague informational feedback may require greater information processing and therefore, greater cognitive load, which can be de-motivating (Shute, 2008). Therefore, specific, informational feedback can mitigate the detrimental effect of negative feedback on motivation.

Autonomy-supportive feedback

Individuals often have internal standards that they strive to attain. Because feedback can supersede these standards and create a dependence on external praise as the sole standard for success, it has the potential to inhibit one's sense of autonomy, and ultimately one's level of motivation (Henderlong & Lepper, 2002). With this in mind, according to cognitive evaluation theory, the extent to which feedback is delivered in a controlling manner will influence its effect on intrinsic motivation. Feedback that is perceived as controlling diminishes motivation by reducing one's sense of autonomy (Ryan, 1982). A meta-analysis examining the effects of rewards on intrinsic motivation demonstrated this, showing that the effect of reward was moderated by the extent to which it was administered in a controlling manner (p. 652, Deci et al., 1999). In line with this, feedback that is communicated using controlling language, for example, by informing the individual of what he or she "should" have done or "needs" to do in the future may undermine intrinsic motivation more than feedback that uses non-controlling language. Autonomy-supportive language communicates that the individual is in control of his or her own behavior (i.e., "you could do…" or "you might consider…") (Mourtadis et al., 2010; Ryan et al., 1983).

Attributional feedback

Whether feedback includes external performance attributions or internal attributions may moderate the relation between negative feedback and motivation (Mueller & Dweck, 1998; Henderlong & Lepper, 2002). When providing feedback,

attributing performance to ability as opposed to effort or other process-focused factors may be detrimental when individuals face challenge or subsequent failure. Negative feedback may be more detrimental when focused on ability rather than effort because ability is generally believed to be something the individual can do little to change in the immediate future, whereas effort is within the individual's control (Weiner, 1994). This distinction has been shown to have motivational effects when providing praise (Mueller & Dweck, 1998). Specifically, students who received praise for their ability demonstrated significantly less post-failure task persistence and task enjoyment compared to students who received praise for their effort. However, this assertion has never been formally examined in the literature on negative feedback. It is also important to note that attributing effort or ability may occur in all four levels hypothesized by Hattie and Timperley (2007).

Normative vs. criterion-based feedback

Although research has sometimes found that praise that focuses on social comparison or normative praise (i.e., "Good job, you scored higher than 80% of your peers") to be more motivating (Deci, 1971; Harackiewicz, 1979; Shanab et al., 1981) compared to no praise, other research suggests that mastery or criterion-based praise will be more beneficial compared to social-comparison praise (e.g., Ames, 1992; Butler, 1987; Krampen, 1987). In particular, an overreliance on normative-based feedback has been found to lead to decreased persistence during setbacks (Corpus, Ogle, & Love-Geiger, 2006). Corpus et al. (2006) argued that social comparison may prevent children

from enjoying a task and achieving their potential and that relying on social comparisons inadequately equips them to handle situations when others outperform them. Moreover, according to SDT, social comparison often leads to competitive attitudes, one form of external regulation of behavior (Deci & Ryan, 1985). Given the observed relations in the praise literature, we might expect that negative feedback that uses social comparison will have more deleterious effects on motivation than criterion-based feedback. However, this has yet to be examined.

Timing of feedback

Additionally, the timing of the feedback may additionally moderate the negative feedback-motivation relationship. Henderlong and Lepper (2002) suggested that the timing of praise plays a crucial role in how sincere it is perceived to be and thus how beneficial to motivation. Specifically, praise delivered soon after the task is completed signals greater sincerity whereas a long delay may communicate a lack of care. Other research has suggested that feedback that is provided immediately after the performance is the most effective for facilitating learning (Lepper et al., 1997).

With these research findings in mind, an information processing or goal theory perspective might predict that receiving feedback in close proximity to task completion is more beneficial because the possibility to improve can occur sooner. However, from an SDT perspective, if immediate praise is more beneficial than praise delivered temporally distant to performance, than it is expected that immediate negative feedback is potentially more detrimental than temporally distant feedback. Although the role of timing in the

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relation between negative feedback and motivation has not been directly studied, it stands to reason that negative feedback that is delivered in closer proximity to the performance will enhance motivation only when the feedback is need-supportive, or informational, autonomy-supportive, and privately delivered. If individuals know immediately how to modify their subsequent behavior and feel autonomous and sheltered while doing so, they may have greater IM towards that task (Baron, 1988b). On the other hand, a delay may mitigate the detrimental effect of negative feedback (Vogel, 1975), especially when the feedback is non-informational, controlling, and publically delivered. Since the effect of the reinforcement loses its influence over time, delay can reduce the potency of both positive and negative feedback.

Characteristics of the Task

Although little research has focused on task characteristics as a factor that may influence the effect of negative feedback on motivation, the type of task and task interestingness seem likely to be important as moderators.

In one of the earliest SDT studies examining the effect of negative feedback, Deci and Cascio (1972) found that individuals who had received negative feedback during an interesting task had lower intrinsic motivation compared to individuals who received praise. In fact, it would seem reasonable to suggest that the effect of feedback may be minimal when motivation for the task is low to begin with, as it might be for an uninteresting task. That is, in the context of an uninteresting task, there is little intrinsic

motivation to undermine. In contrast, there is more opportunity for negative feedback to undermine intrinsic motivation for an interesting task that is inherently motivating.

Characteristics of the Evaluator

Quality of relationship

With relatedness as one of the three central tenets of SDT, the quality of the relationship between evaluator and feedback receiver may moderate the effect of negative feedback. In the context of a close and caring relationship, feedback may be perceived as more authentic and intended to help (Henderlong & Lepper, 2002). In contrast, feedback may be received as controlling if there is mistrust or a poor relationship quality (Bryk & Schneider, 2002), potentially leading to perceived bias of the evaluator and the dismissal of the feedback. A better quality relationship may also lead the feedback receiver to perceive the evaluator as more sincere. This may be important because sincerity is described as a necessary condition in order for praise to be accepted and to have a positive motivational effect (Henderlong & Lepper, 2002). Without perceived sincerity of the evaluator, the extent to which the feedback can either bolster or reduce motivation becomes irrelevant. In the praise context, the evaluator may be perceived as insincere when highly effusive or vague praise is given, which can be easily discounted by the receiver as inauthentic. On one hand, greater relatedness may lead to more charitable and "sugar-coated" feedback, which can be perceived as insincere. In this case, negative feedback may have little effect on intrinsic motivation. On the other hand, negative feedback that comes from a trusted other is more likely to be perceived as an attempt on

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the part of the other person to help the individual improve in some way, which may enhance intrinsic motivation. Despite this speculation, the moderating effect of the quality of the relationship has yet to be examined.

Expertise

The evaluator's level of expertise may influence how the negative feedback is interpreted (Lepper & Chabay, 1985). Evaluative feedback is most persuasive when the people who provide the information are viewed as knowledgeable and reliable (Bong & Skaalvik, 2003). That is, negative feedback from an expert is likely to be perceived as more credible just at face value and will be given greater consideration, whereas, negative feedback from a novice could be taken lightly and potentially dismissed (Lepper & Chabay, 1985). As such, it is expected that the effect of negative feedback will be stronger when an evaluator with more expertise delivers it.

Characteristics of the Feedback Receiver

Age and sex

Prior research has suggested that age and sex may be two important characteristics of the feedback receiver that moderate the effect of feedback on motivation. Specifically, a meta-analysis conducted by Deci and colleagues (1999) on the effects of rewards suggested that the effect of praise was not ubiquitous across age, finding that verbal reinforcements enhanced intrinsic motivation among college students, but not among children. They explained this finding by suggesting "children ongoingly

experience more attempts by adults to regulate their behavior with rewards and other potentially controlling contingencies than do college students" (p. 656), and college students are better at separately interpreting the informational and controlling aspects of feedback. With this finding in mind, it seems likely that age may similarly moderate the effect of negative feedback on intrinsic motivation.

Deci and colleagues (1999) also found that female participants experienced praise as more controlling, which led to decrements in intrinsic motivation after receiving positive feedback, whereas male participants had enhanced intrinsic motivation. Some research has found that females are more sensitive to negative feedback (Deci, Cascio, & Krusell, 1973; Vallerand & Reid, 1988), whereas other research has found no difference between genders (Shanab et al., 1981). Given these mixed findings, the role of gender seems to be an important moderating factor to consider in the present research synthesis.

Culture and race

Although the majority of feedback research has been conducted in the United States, there is some cross-cultural evidence examining the effects of feedback (see Heine, Lehman, Markus, & Kitayama, 1999; Salili, Hwang, & Choi, 1989). Further, there is reason to believe that the effect of negative feedback may vary across cultures due to the greater value for effort over ability in more collectivist cultures (see Henderlong & Lepper, 2002 for discussion on this dynamic regarding praise). Perhaps the ego-diminishing effects and detriments of negative feedback to perceived competence may be weaker among individuals coming from a collectivistic culture. In turn, negative

feedback may be less likely to diminish IM among individuals coming from a collectivist culture. In addition, research examining racial differences between feedback receiver and evaluator may influence how the negative feedback is interpreted and responded to (Cohen et al., 1999; Yeager et al, 2014).

Individual differences in motivation

The complex effects of negative feedback may also be clarified by considering the roles of personality, motivational, and self-related characteristics of the feedback receivers (Kluger & Denisi, 1996). In particular, chronic individual differences in satisfaction for psychological needs may also influence the effects of feedback. Praise scholars have suggested that feedback's motivational influence is tied to how competent and efficacious the feedback recipient feels such that praise verifies their ability and enhances motivation for individuals who feel more competent (Hattie & Timperley, 2007; Henderlong & Lepper, 2002; Swann, Pelham, & Chidester, 1988).

Consistent with this finding in the praise literature, one possibility is that an individual's perceived competence for the task may influence the effect of negative feedback such that feedback has a slight negative effect for individuals with low perceived competence, and a stronger negative effect for individuals with high perceived competence. To explain further, for a person with low perceived competence, negative feedback may underscore an existing lack of confidence and diminish motivation only to a limited extent given that motivation was already likely low. In contrast, for a person with a high sense of perceived competence, negative feedback may be particularly

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offensive given its conflicting status with current beliefs about the self. Consequently, negative feedback may be particularly demotivating for individuals with high initial perceived competence (Hattie & Timperley, 2007).

Alternatively, it is possible that feedback may be more detrimental for individuals low in perceived competence and potentially adaptive for individuals with high perceived competence. This possibility is supported by SCT research showing that highly self-efficacious individuals make more optimistic predictions about their performance after receiving criticism compared to praise and often intentionally seek out unfavorable feedback to improve their performance (Swann, Pelham, & Chidester, 1988). Goal theorists suggest that for individuals with high perceived competence, the underlying mechanism between negative feedback and greater motivation is self-set goals and goal commitment which leads to intensified effort (Locke, Frederick, Lee, & Bobko, 1984). In contrast, negative feedback may diminish motivation among low self-efficacious students because it may be more likely to produce negative affect and uncontrollable attributions toward failure (i.e., ability attributions) among such individuals (Hattie & Timperley, 2007; Kernis, Brockner, & Frankel, 1989).

Individual differences in self-regulation such as regulatory focus (Higgins, 1997) have been found to moderate the effectiveness of positive and negative feedback (Van-Dijk & Kluger, 2004). In particular, Van-Dijk and Kluger showed that negative feedback increased intention to exert effort when participants had a prevention focus (focus on avoiding risk or negative outcomes) rather than a promotion focus (focus on obtaining positive outcomes). This finding can be explained by the fact that individuals with a

prevention focus are more likely to be sensitive to the presence or absence of punishment and use avoidance as a strategy (Van-Dijk & Kluger, 2011). As such, there would be congruence between regulatory focus and environmental factors for those with prevention focus receiving negative feedback, which in turn, should facilitate motivation (Idson & Higgins, 2000). However, it is likely that this effect is short lived in that it may lead to future task avoidance behavior among prevention focused individuals (Hattie & Timperley, 2007). Alternatively, negative feedback may also increase the motivation of individuals with a promotion focus as they become more dissatisfied with their criticized performance and subsequently set higher goals (Podsakoff & Farh, 1989). All in all, the role of regulatory focus seems to be an important moderator to evaluate in this synthesis.

Methodological Factors That Affect the Impact of Negative Feedback

Various methodological factors may moderate the relationship between feedback and intrinsic motivation.

Control condition

One important factor is the control condition or whether the comparison to negative feedback is positive feedback (praise) or no feedback (Hattie & Timperley, 2007). Deci et al. (1999) argued that research on verbal rewards had inconsistent comparison groups, and additional precaution needs to be taken for future studies that examine feedback conditions. Assuming that negative feedback generally undermines motivation and positive feedback generally enhances motivation, if negative feedback is

compared to praise, the undermining effect is likely to be stronger than when it is compared to no feedback or neutral feedback (e.g., "You completed the task").

Measure of motivation

Second, another particular methodological issue is the type of motivation measure: self-reported or behavioral. Deci et al. (1999) found differential effects of praise depending on what intrinsic motivation measure was used. Further, non-significant correlations between the behavioral and self-reported measures have caused doubt on whether they index the same construct (Wicker, Brown, & Paredes, 1990). Although self-reported measures of motivation may be subject to biases such as social desirability, acquiescence, and retrospective reconstruction of past events they are more sensitive to the manipulations that occur in experimental settings (Patall, Cooper, & Robinson, 2008). Conversely, behavioral measures can have multiple determinants and are therefore less sensitive to manipulation in the experimental setting (Patall et al., 2008). Given these considerations, differences between the two intrinsic motivation measures upon receiving negative feedback were tested in this meta-analysis.

Experimental studies that measure self-reported motivation typically use task-specific measurements of intrinsic motivation (e.g., a task interest survey), but some studies may measure a general form of motivation as an outcome. Therefore, alignment between the outcome and feedback manipulation may be an important moderator. Experimental context. Thirdly, the experimental context in which the feedback is administered may also be important. Consistent with a past meta-analysis coming out of

a SDT perspective, the difference between an applied or realistic setting such as a classroom or workplace compared to a controlled laboratory setting may moderate the feedback's effect (Patall et al., 2008). Therefore, differences in the effect of negative feedback on motivation across settings are expected.

Feedback authenticity and expectancy

It is common in the experimental paradigm of feedback studies to provide negative or positive feedback regardless of the participants' actual performance, in order to induce a strong treatment effect. However, the psychological tension that might arise from perceiving a discrepancy between one's performance and evaluation may affect how motivated the participant is for the task. Nevertheless, there is no empirical evidence that assesses this factor and how it may moderate the feedback-motivation relationship. Second, whether the participants expect to receive feedback while engaging in task or not may influence how both the task and feedback are perceived. From the SDT perspective, simply knowing that one is being evaluated fundamentally elevates the experience of external control (e.g., Deci & Cascio, 1972). Thus, being told beforehand that feedback will occur may diminish the intrinsic interest in the task and strengthen the detrimental effect of negative feedback on motivation. This speculation will be assessed with feedback expectancy tested as a moderator in this study.

NEED FOR A SYNTHESIS ON THE EFFECT OF NEGATIVE FEEDBACK

A large literature on the effects of negative feedback on motivation has accumulated over the last 40 years, making a research synthesis of the empirical data timely. Moreover, mixed research findings and theoretical perspectives have led to a gap in understanding what the overall effect of negative feedback may be, as well as the extent to which characteristics of the feedback, the feedback givers and receivers, the task, the setting, and the measurement influence the effect of negative feedback on motivation. To address this need, this meta-analysis synthesized existing research on the effects of negative feedback on motivation to reconcile the inconsistent literature and various competing hypotheses. The study is guided by two related questions:

What is the overall effect of negative feedback on motivation?

What factors explain variation in the relationship between negative feedback and motivation?

Answers to these questions were obtained by conducting a new state-of-the-art research synthesis, including a meta-analysis of research findings (Cooper, Hedges, & Valentine, 2009). A meta-analysis provided a means to assess variations in the relation between negative feedback and motivation that have been examined both within and between studies. Additionally, this meta-analysis built on previous research syntheses examining the motivational effect of praise and the effect of feedback on performance (Deci et al., 1999; Hattie & Timperley, 2007; Henderlong & Lepper, 2002; Kluger & Denisi, 1996) by continuing to systematically synthesize knowledge addressing the effects of feedback and the tenets of motivation and learning theories. I limited the

outcomes of this meta-analysis to motivational outcomes given the number of syntheses that have focused on performance (for a historical overview, see Kluger & Denisi, 1996). On the basis of the relevant theoretical approaches to understanding the effects of negative feedback on intrinsic motivation, I predicted the following:

Overall, negative feedback will diminish motivation compared to positive feedback. When compared to no feedback, the detrimental of negative feedback will be weaker. The detrimental effect of negative feedback on motivation will be mitigated or reversed when the following feedback characteristics are present:

a) feedback is directed at the task or process level instead of the self-level;

b) feedback is mild and infrequent to minimize the ego-threatening potential of destructive feedback with the inclusion of praise;

c) feedback is delayed after task completion and delivered in non-face-to-face settings;

d) specific, corrective feedback that provides direction regarding how to improve is given instead of vague or non-informational feedback;

e) feedback language that supports the autonomy of the feedback receiver is used rather than controlling language;

f) feedback emphasizes effort attributions rather than ability attributions; and

g) feedback is criterion-based rather than normative or based on social comparisons.

Additionally, two predictions regarding the role of the task and evaluator are made:

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h) the effect of negative feedback will be smaller on tasks that are uninteresting

i) the detrimental effect of negative feedback will be smaller when the evaluator is perceived as close (high relatedness) and possessing expertise.

In addition to these theoretically based predictors, I also tested several other moderators because the literature suggested they may be important despite a lack of theoretical rationale for forming a particular hypothesis. Feedback receivers' motivational characteristics (high perceived competence and goal self-regulatory focus) were tested as moderators, but no predictions were made regarding their effect due the inconclusive evidence. Other moderators include age of the participants, gender, culture, the authenticity of the feedback (whether it was artificially manipulated or reflected actual performance), whether individuals expected to receive feedback, the type of intrinsic motivation measure (behavioral vs. self-reported), and the experimental setting.

Chapter Three: Method

Research syntheses primarily focus on empirical studies and seek to summarize past research by drawing conclusions from multiple, separate investigations that address related or identical topics. This project employed state-of-the-art methods to perform the research syntheses (Cooper, Hedges, & Valentine, 2009). These methods involved an approach that viewed research synthesis as a data gathering exercise and applied criteria similar to those employed to judge the validity of primary research (Cooper, 1998). The approach required (a) precise problem definition, (b) exhaustive and unbiased gathering of the research evidence, (c) careful examination of the strengths and weaknesses of the included research, (d) appropriate methods for data integration, including meta-analysis, (e) cautious interpretation of the cumulative evidence, and (f) complete reporting of the syntheses' methods and results. The following section describes the procedures used to conduct this meta-analysis, including subsections addressing study inclusion criteria, literature search and information retrieval, coding procedures, effect size calculations, data integration, and search outcomes.

INCLUSION CRITERIA

To be included in the meta-analysis, a study was required to meet several criteria. First, all studies included in the meta-analysis needed to have employed a feedback manipulation using random assignment. This means that participants in one condition received some type of negative feedback and participants in the comparison group either

received no, neutral, or positive feedback. The comparison condition could also be another type of negative feedback to assess whether particular elements of negative feedback may moderate the effect on motivation. Also, motivation and related outcomes were measured following the feedback manipulation.

Second, because the effect of feedback on motivation was of primary interest to this meta-analysis, a study had to involve a measure of motivation. For the purposes of this meta-analysis and in line with a definition of motivation as any force that energizes and directs behavior (Reeve, 2009a) any measure of an individual's urge, intention, engagement, or persistence related to a task was included. Intrinsic motivation was a specific form of motivation that was frequently assessed in studies examining the effects of negative feedback due to the relevance of self-determination theory to the research question. I included any measure of task interest or enjoyment, time spent on a task without external pressure or constraints, or reports of willingness to engage in the task again in the future or choosing more tasks as measures of intrinsic motivation. Whereas the parallel of intrinsic motivation, extrinsic motivation or the propensity to engage in a task for reasons or outcomes separable from the inherent satisfaction of engaging in a task (Ryan & Deci, 2000), would also have met the definition of "motivation" more broadly as one specific form of motivation, I did not encounter any studies in which extrinsic forms of motivation were assessed as an outcome. I acknowledge that there are other forces and processes associated with motivation such as goals, goal orientations, self-beliefs, and values, but these were only included if a measure of motivation as defined above was present. If a study did not report a motivation measure, it was

excluded. If a study also reported the effect of feedback on an antecedent or correlate of motivation (i.e., perceived competence, autonomy, and relatedness, preference for challenge, or effort), these effects were also recorded. Despite interest in how feedback may influence subsequent task performance, this outcome was not included in this meta-analysis due to previous reviews on the topic (see Kluger & Denisi, 1996). These inclusion criteria were implemented in order to reduce the potential heterogeneity of the sample of studies and to allow the effect of negative feedback on motivation to be compared to the effect of negative feedback on correlates of motivation within the same sample of studies.

Third, two sampling restrictions were placed on the included studies. Studies included non-U.S. participants, but only if the study was written in English. A large number of studies with non-U.S. samples allowed moderator analyses of whether the effect of criticism varies across cultures. All non-English studies were excluded. Additionally, studies using learning disabled and behaviorally disordered individuals as the target sample were excluded because few studies have examined the effects of negative feedback in this restricted population and thus, including these studies still would not warrant generalizing conclusions about the effect of choice to these restricted populations.

Quasi-experimental studies without random assignment to conditions were not included. Studies that utilized a one group posttest-only or a one-group pretest-posttest design were not included. Similarly, single group cross-sectional studies using multivariate statistics or simple bivariate correlations to describe the negative feedback

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and motivation relationship were not included. Finally, the report needed to contain enough information to permit the calculation of an estimate of the effect of negative feedback on a relevant outcome.

A brief discussion of two examples of included and excluded studies serve to illustrate the inclusion criteria.

An example of an included study

Vallerand and Reid (1984) compared giving positive feedback, negative feedback, and no feedback to participants engaging in a stabilometer motor task, a good predictor of athletic performance. Participants previously indicated moderate to high levels of intrinsic motivation on the task and were randomized into feedback conditions. A self-report measure of intrinsic motivation was given, and the authors provided enough information about inferential test statistics to derive effect sizes summarizing the difference between a) negative feedback and positive feedback and b) negative feedback and no feedback on intrinsic motivation.

This study was included because there was a feedback manipulation comparing individuals who received negative feedback to those in a non-negative feedback on subsequent intrinsic motivation. Moreover, they provided enough data to calculate an effect size.

An example of an excluded study

Koka and Hein (2006) studied the relationship between performance feedback and intrinsic motivation in physical education among students in sixth and eighth grades. They gave the participants a survey to self-report the degree to which teachers gave them controlling or informational feedback as well as their level of intrinsic motivation towards sports.

This study was excluded because there was no feedback manipulation; rather feedback given by physical education teachers was measured as it naturally occurs for students in the sixth and eighth grades. Although there was a measure of intrinsic motivation, because there was no experimental design, this study was excluded from the synthesis.

LITERATURE SEARCH PROCEDURES

Multiple strategies were used to locate all possible relevant studies that met the inclusion criteria. First, the following electronic reference databases were searched for documents catalogued before December 2012: PsycINFO, ERIC (Educational Resources Information Clearinghouse), Proquest Dissertations and Theses, and Google Scholar. For each database, a series of search terms were employed using at least one term regarding feedback ("feedback," "evaluation," "criticism") and motivation ("motivation," "interest," "persistence," "self-determination"), applying the appropriate truncation and Boolean techniques to achieve an inclusive yet focused search. The complete search strategy is provided in Appendix A: Search Strategy.

Once this search strategy was employed, and all citations had been retrieved, abstracts for these studies were judged for relevance, resulting in a pool of studies that would possibly meet the inclusion criteria. The full texts of these potentially codeable studies were reviewed and evaluated with the inclusion criteria. Ancestry searches were conducted by reviewing the reference section of all relevant studies retained for coding as well as review articles. Descendent searchers were conducted in Social Sciences Citation Index for the following two articles, Deci (1972) and Deci and Cascio (1973), to find papers that had cited these early pieces on the effect of negative feedback on motivation.

Additional studies, in particular unpublished data or grey literature, were obtained through contacting the following listservs: Motivation in Education Special Interest Group from the American Education Research Association, Division 15 (Educational Psychology) and Division 47 (Sports Psychology) from the American Psychological Association, and Society of Personality and Social Psychology. Finally, requests via electronic mail were made to several prominent researchers in the motivation and feedback areas regarding access to any relevant data that were not publicly available. Specifically, three researchers whom the database of studies revealed have published two or more studies on negative feedback and motivation were contacted directly in order to access research that would not be included in the reference or citation databases.

CODING FRAME

Numerous characteristics of each study were coded directly from the research report. In some instances, some inference was necessary such as using pre-established

definitions to code ambiguous characteristics. In addition, when information was too ambiguous for inference or simply missing in a research report and the study was published later than 2000, I made attempts to contact the study author(s) via electronic mail to obtain information. The coded characteristics encompassed seven broad distinctions among studies: a) the research report; b) the research design; c) the feedback manipulation; d) the task; e) the sample; f) the measure of motivation (e.g., free time spent on task, self-reported interest level); and g) the estimate of the relationship between negative feedback and motivation. As is true in all meta-analyses, many of the study characteristics I attempted to code were not reported by primary studies and were noted as missing. The entire coding guide is presented in Appendix B, and the categories of characteristics are outlined below.

Research report characteristics

Each effect size entry began with the name of the first or sole author and the year in which the study was published. Next, each study was coded for report type: journal article, doctoral dissertation, thesis, conference paper, or other type of report. This was coded to measure and test publication bias.

Research design

First, I coded at which level the sampling occurred: the participant level, the session level, a classroom or team level, or another level of condition assignment. Third,

whether the design was experimental in the laboratory or in an applied setting (e.g., classroom, gym, office) was coded.

Feedback characteristics

The nature of both feedback conditions (treatment and control) was separately coded on a variety of characteristics. Both negative and control feedback conditions were coded for the following characteristics: a) feedback level (task, process, self-regulation, self; Hattie & Timperley, 2007); b) quantity and intensity; c) mode and timing; d) provided information for improvement; e) autonomy-support; f) attributional feedback (ability vs. effort); g) normative versus criterion-based; h) what the feedback referred to: task performance, task completion, or task engagement; i) the inclusion of praise and j) whether the feedback was authentic (based on actual task performance) or manipulated; and k) whether participants were aware that they were going to receive feedback or not.

Task

The nature of the task and its level of difficulty and interestingness were coded. I coded whether the task involved verbal, content-related activities, cognitive tasks, spatial puzzles, math puzzles, a physical activity task or another activity. The difficulty level of the task was coded based on the description in the report as difficult, moderate or easy. Lastly, I coded whether the task was described as interesting, non-interesting, or neutral.

Sample

Next, information about the evaluator and the receiver of the feedback was coded separately. First, characteristics of the receiver of the feedback were coded. Because feedback studies occur in a variety of contexts, the type of samples included students, athletes, and employees. Next, the average age and/or school grade, percentage of female participants, country of origin, ethnicity, and socioeconomic status of the sample were coded. Athletic characteristics like type of sport or activity, level of competition (pre-collegiate, collegiate, professional), and experience level (novice, expert) were coded. Performing art characteristics such as type of activity and experience level were also coded when relevant. Characteristics of the employment context such as type of institution (for profit, non-profit), the type of company (trade, business, technology, research, manufacturing), and length of employment were coded.

Prior motivational orientation of the sample was recorded with the following codes: a) high or low initial interest level (the degree to which the individual enjoys or would want to engage in the task at the beginning of the study), b) initial perceived competence (the belief that one will succeed in a task), c) initial competence valuation (the degree to which a sense of competence is appreciated), and d) initial task value (how much the task is deemed important or useful by the individual).

Lastly, characteristics regarding the evaluator were coded. In particular, the quality of the relationship between the evaluator and feedback receiver and the expertise level of the evaluator were coded.

Measure of motivation and related outcomes

The dependent variable of motivation has been measured through a variety of methods. The primary measure of intrinsic motivation is the degree to which participants engage again in a task and persist during a free-choice period in which engagement in the task is no longer required. This can be measured directly as the average amount of seconds spent doing the target activity, the proportion of participants who spent any time with the target activity, or the number of trials or successes with the target activity during a free-choice period (see Deci et al., 1999).

Another measure of intrinsic motivation is self-reported interest, willingness to engage in the task, or enjoyment in a task, assessed by either a single item or a multiple item factor. If interest and enjoyment were measured as separate items or constructs with available information to calculate an effect size, both measures were coded to measure any differences between studies that define intrinsic motivation as interest and those that define it as enjoyment. Assessments of intrinsic motivation that were composites of both behavioral and self-report measures were also coded.

When a study included both a behavioral measure and a self-reported measure of intrinsic motivation, both measures were coded. This allowed the comparison of negative feedback effects on self-report versus behavioral measures of intrinsic motivation.

In contrast, unspecified motivation did not include aspects of free choice. When assessing task persistence, the amount of time was not measured during a free play or free choice period, but was persistence during the task itself. Although this may measure the degree to which the participant complies with the task instructions instead of personally

choosing to engage in the task, there is still a degree of participant motivation. In contrast to intrinsic motivation, general unspecified motivation represents motivation to engage in a task that may not be necessarily attributed to task interest, enjoyment, or satisfaction due to the absence of choosing to engage in the task.

In addition to the measure of motivation used, the target of motivation was coded using the following domain categories: work-related, academic, subject-specific, task-specific, sports-related, art and music, social, and other. Although most experiments assessed task-specific motivation, some studies measured a more general form of motivation. Therefore, the alignment between the outcome and feedback manipulation was coded. The reliability of the self-reported measure was coded when provided. Both estimates originating from the report sample and prior reliability research were accepted. Lastly, the respondent of the motivation measure was coded as the feedback receiver (e.g., student, athlete, or employee), the evaluator, the researcher, or another source that was reporting on the target individual's level of motivation.

Other related outcomes were perceived competence, effort, autonomy, value and importance, and pressure and tension. Perceived competence is the expectancy that one can effectively with our environment and is measured as a self-report. Effort involves the work exerted into the task and can be measured as a self-report. Autonomy was self-reported as feelings that one's actions are coming from the self. Value and importance are self-reported assessing the degree to which a task is important for the self or valuable in regards to how useful it is for the future. Pressure and tension, a negative predictor of

motivation, is the self-reported degree to which action is manipulated from an external rather an internal force.

Effect size codes

In order to calculate effect sizes from individual studies, a variety of data were extracted, including means and standard deviations for negative feedback and control conditions, inferential test statistics, p-values, frequencies, or proportions. The relevant sample sizes of the conditions were coded. When available, a d-index or standardized mean difference was calculated and coded.

EFFECT SIZE CALCULATION

I used standardized mean difference to estimate the effect of negative feedback on measures of intrinsic motivation. The d-index (J. Cohen, 1988) is a scale-free measurement of the distance between two group means, which is calculated by dividing the difference between two group means by a pooled standard deviation. This calculation results in a measure of the difference between the two group means expressed in terms of their common standard deviation.

For example, a d-index of 0.50 indicates that one-half standard deviation separates two group means. In this meta-analysis, I subtracted the mean of the comparison feedback conditions from that of the negative feedback condition; then, divided this difference by the pooled standard deviation. Therefore, a negative effect size indicates that receiving negative feedback was less motivating than receiving non-

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negative feedback. When possible, I calculated overall and subgroup (e.g., boys and girls) effect sizes from means, standard deviations, and sample sizes. When this information was not reported in a study, corresponding inference test statistics (e.g., t-statistic, F-statistic, p-values) were used to derive an effect size. In the case when sample size information was unavailable, I used the inference test with assumed equal sample sizes (see Rosenthal, 1994). If statistical significance was denoted yet both raw data and inferential test statistics were unavailable, a conservative effect size was derived with an assumed p-value of 0.05.

CODER RELIABILITY

I trained a graduate student to code half of the studies. The second coder had experience coding for a meta-analysis and was extensively trained for each code. Coders extracted information from reports independently. As a reliability check, all pairs of codes for each study were compared for agreement between the two coders. I calculated a simple reliability measure between coding by dividing the number of matched codes by the total number of codes (98). Half of the included studies were double coded to establish reliability. The reliability was 88.78%. Once reliability was established, I coded the remaining studies. Problematic codes during reliability calculation were the effect size measure and feedback characteristics; therefore, all of these codes were double coded. When disagreements arose regarding both the content of the code or the presence of relevant information in a study, a third party helped resolve disagreements.

METHODS OF DATA INTEGRATION

Before conducting any meta-analytic procedures, the number of positive and negative effects was counted. Then, I calculated the range of estimated relationships of negative feedback and motivation and related outcomes. In addition, I examined the distribution of effect sizes to inspect for any statistical outliers. Outliers were identified by applying Grubbs' (1950) test, and if detected, were Winsorized to their next nearest neighbor. This procedure was repeated until no outliers are identified for both the overall set of effect sizes and subgroups of effect sizes.

Due to the possibility of not obtaining all the studies that have investigated the relationship between negative feedback and motivation either due to failure on the part of the meta-analyst to retrieve all relevant reports or censoring on the part of authors, I employed Duval and Tweedie's (2000a, 2000b) trim-and-fill procedure to assess whether the effect size distribution differed from normally distributed estimates. This trim-and-fill method imputes missing values that would be present to approximate a normal distribution of effect sizes; this estimation indicates the impact of data censoring on the observed effect size distribution.

Calculating average effect sizes

A weighting procedure was used to calculate average effect sizes across independent samples. Each effect size was first multiplied by the inverse of its variance; then, the sum of these products was divided by the sum of their inverses. This procedure allows more weight to samples of larger size, which is generally preferred (Hedges &

Olkin, 1985) since larger samples give more precise population estimates. In addition, I calculated 95% confidence intervals for weighted average effect sizes; if the interval does not contain zero, the null hypothesis that negative feedback had no effect on motivation was rejected.

Identifying independent hypothesis tests. When calculating effect sizes, determining whether an effect size is independent (the participants in one sample providing the observations do not overlap with another sample) can be problematic when there are multiple effect sizes from a single sample (i.e., multiple levels of potential moderators). Therefore, I used a shifting unit of analysis approach (Cooper, 1998).

This approach involved coding as many effect sizes from each study as exist as a result of variations in characteristics of the manipulation, sample, setting, and outcomes within the study. However, when calculating the overall effect size, the multiple effect sizes were averaged to create a single effect size for each study. For example, if motivation was measured in two different ways (self-reported and behavioral), when testing the nature of the criterion variable as a potential moderator (e.g., self-reported versus behavioral), the study would be allowed to contribute a single effect size to each estimate of a category mean effect size. To calculate an overall effect size of negative feedback, a weighted average of these two effect sizes was computed and entered prior to analysis, so that the study would only contribute one effect to the assessment of the overall effects of negative feedback on motivation. The shifting unit of analysis approach maximizes the amount of data from each study without violating the assumption of independent data points.

Moderator analysis

Effect sizes may vary even if they estimate the same underlying population value; therefore, homogeneity analyses were needed to determine whether sampling error alone accounted for this variance compared to the observed variance caused by features of the studies. I tested homogeneity of the observed set of effect sizes using a within-class goodness-of-fit statistic (Qw), which followed an approximate a chi-square distribution with k – 1 degrees of freedom (k equals the number of effect sizes). A significant Qw statistic suggested that sampling variation alone could not adequately explain the variability in the effect size estimation; it followed that moderator variables should be examined (Cooper et al., 2009). Similarly, homogeneity analyses can be used to determine whether multiple groups of average effect sizes vary more than predicted by sampling error. In this case, statistical differences among different categories of studies were tested by computing the between-class goodness-of-fit statistic, Qb, which follows a chi-square distribution with p – 1 degrees of freedom where p equals the number of groups. A significant Qb statistic indicated that average effect sizes vary between categories of the moderator variables more than predicted by sampling error alone.

Fixed and random effects. In a fixed effects model of error, each effect size's variance is assumed to reflect only sample error or differences among participants in the study. In a random effects model of error, a study-level variance component also is assumed to be an additional source of random variation. Due to the potential to over- or under-estimate error variance in moderator analysis (Hedges & Vevea, 1998), I conducted all the

analyses twice using both models of error as a form of sensitivity analyses in order to examine the effect of different assumptions on the outcomes of the synthesis.

Lastly, I conducted all statistical analyses using the Comprehensive Meta-Analysis statistical software package (Version 2.2; Borenstein, Hedges, Higgins, & Rothstein, 2005).

Chapter Four: Results

The literature search uncovered 79 studies that examined the effect of negative feedback on motivation compared to positive, neutral, no feedback, or a second form of negative feedback. The 79 studies reported 418 separate effect sizes based on 91 separate samples. The authors, sample sizes, and effects for these studies along with other important study characteristics are listed in Table 1. Of the effect sizes, 289 represented the effect of negative feedback on motivation compared to positive feedback, 68 of which were overall effects collapsed across subgroups. Eight-two effect sizes represented the effect of negative feedback on motivation compared to neutral or no feedback, 38 of which were overall effects collapsed across subgroups. Many studies also reported the effect of negative feedback on other relevant motivation outcomes including perceived competence, effort/importance, autonomy, and pressure/tension. I did not include effects of feedback on measures of performance, self-esteem, or other attitudinal measures because previous research had examined these outcomes, or I had limited motivation outcomes to those representing direct urges or intentions.

The 79 studies appeared between the years 1971 and 2012. The sample sizes ranged from 8 to 359. For each outcome, I used Grubbs' test to identify outliers within that set of effect sizes. No outliers were detected for any of the outcomes assessed in this study. For outcomes with fewer than three effect sizes contributing to the average weighted effects, no test of outliers were conducted.

First, I examined whether the comparison of negative feedback to positive feedback and to neutral feedback was significantly different on the combined motivation outcome (intrinsic and general). Results indicated that the average effect of negative feedback compared to positive feedback was significantly larger than compared to neutral feedback (FE: $Q(1) = 12.21$, $p < .001$, RE: $Q(1) = 1.60$, $p = .21$) and compared to no control feedback (FE: $Q(1) = 65.77$, $p < .001$, RE: $Q(1) = 7.74$, $p < .01$. There was no significant difference between the comparison with neutral feedback and the comparison with no control feedback (FE: $Q(1) = 1.59$, $p = .21$, RE: $Q(1) = 0.02$, $p = .90$). Therefore, these two categories were collapsed into a single category I called the *neutral or no feedback control* condition. In addition, I opted to conduct all analyses in two groups: negative feedback vs. positive feedback and negative feedback vs. neutral or control no feedback. The same set of moderator analyses were conducted for each group when possible.

OVERALL EFFECTS OF NEGATIVE FEEDBACK COMPARED TO POSITIVE FEEDBACK

First, I examined the overall effect of negative feedback compared to positive feedback on each of the motivation outcomes (see Table 2). For the primary motivation outcome, theory would suggest that intrinsic motivation may differ from unspecified general motivation, I conducted a moderator analysis for the two motivation outcomes to determine if I should treat them separately. I tested whether there was a difference for free-choice behavioral measures and non-free-choice behavioral measures. Moderator analyses revealed there was a significant difference between free-choice behavioral

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measures and non-free-choice measures under fixed error assumptions ($Q(1) = 5.97$, $p <$ .01), but not under random error assumptions ($Q(1) = 0.28$, $p = .60$). Because there is sufficient evidence that these two measures were different, I conducted analyses separately by motivation outcome. I first look at the intrinsic motivation outcome.

Of the 68 overall effect sizes assessing the effect of negative feedback on intrinsic motivation, 11 were in a positive direction and 53 in a negative direction. Four of the effects represented no relationship (e.g., zero). The effects ranged from $d = -2.91$ to 0.82. Under a fixed-error (FE) model, the weighted average d was -0.35 with a 95% CI from -0.40 to -0.30. The weighted average d was -0.44 under a random-error (RE) model with a 95% CI from -0.57 to -0.30. Therefore, the hypothesis that the effect of negative feedback compared to positive feedback on intrinsic motivation is equal to zero could be rejected under both FE and RE models. In addition, the tests of the distribution of the effect sizes revealed that I could reject the hypothesis that the effects were estimating the same underlying population value, $Q(68) = 497.71$, $p < .001$.

I conducted trim-and-fill analyses to look for asymmetry using both fixed-and random-error models (see Borenstein et al., 2005). I searched for possible missing effects on the right side of the distribution, those that would reduce the size of the negative average d. Under the fixed-effects model, I found evidence that 16 effect sizes might have been missing to the right of the mean. Imputing these values would change the mean effect of negative feedback compared to positive feedback to $d = -0.21$, (95% CI = -0.25, -0.16) under fixed effects and $d = -0.21$, (95% CI = -0.35, -0.06) under random effects. Under the random-effects model, I found evidence that 16 effect sizes might have been

missing to the left of the mean. Imputing these values would change the mean effect of negative feedback compared to positive feedback to $d = -0.49$, (95% CI = -0.53, -0.44) under fixed effects and $d = -0.54$, (95% CI = -0.70, -0.38) under random effects. Thus, even when accounting for possible data censoring, the effect of negative feedback on intrinsic motivation compared to positive feedback was negative and significantly different from zero, although its magnitude shrunk by a third under fixed effects, but grew larger under random effects.

Six of the 11 overall effect sizes assessing the effect of negative feedback compared to positive feedback on unspecified general motivation were in a negative direction, and three effects were in a positive direction. Two effects were zero. Effects ranged from, $d = -1.242$ to 0.45. The weighted average d was -0.21 (95% CI = -0.36, -0.07) under a fixed-error model and   -0.36 (95% CI = -0.67, -0.05) under a random-error model, $Q(10) = 37.55$, $p < .001$. Trim-and-fill analyses indicated that three additional effects needed to be imputed to the right of the mean under fixed effects, adjusting the effect size to be -0.09 (95% CI = -0.23, 0.05) under fixed effects and -0.13 (95% CI = -0.45, 0.20) under random effects. Under random effects, trim-and-fill analyses indicated that two additional effects needed to be imputed to the right of the mean under fixed effects, adjusting the effect size to be -0.13 (95% CI = -0.45, 0.20) under fixed effects and -0.21 (95% CI = -0.53, 0.10) under random effects.

Twenty-four of the 25 overall effect sizes assessing the effect of negative feedback compared to positive feedback on perceived competence were in a negative direction, and one was in a positive direction. Effects ranged from, $d = -2.49$ to 0.26. The

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weighted average d was -1.00 (95% CI = -1.09, -0.90) under a fixed-error model and -1.06 (95% CI = -1.38, -0.77) under a random-error model, $Q(24) = 190.46$, $p < .001$. Trim-and-fill analyses indicated that no additional effects needed to be imputed under both FE or RE models.

Next, I explored negative feedback's impact on effort and importance, a commonly relevant construct to intrinsic motivation. Five of the nine overall effect sizes assessing the effect of negative feedback compared to positive feedback on effort and importance were in a negative direction and two were in a positive direction. Two effect sizes were zero, and had no direction. Effects ranged from, $d = -1.02$ to 0.51. The weighted average d was -0.18 (95% CI = -0.33, -0.02) under a fixed-error model and -0.23 (95% CI = -0.56, 0.12) under a random-error model, $Q(8) = 59.47$, $p < .001$. Trim-and-fill analyses indicated that no additional effects needed to be imputed under both FE or RE models.

All three effect sizes assessing the effect of negative feedback compared to positive feedback on autonomy were in a negative direction, ranging from $d = -0.34$ to -0.01. The weighted average d was -0.24 (95% CI = -0.41, -0.07) under a fixed-error model and -0.22 (95% CI = -0.42, -0.01) under a random-error model, $Q(1) = 1.09$, $p = .30$. Trim-and-fill analyses indicated that no additional effects needed to be imputed under both FE or RE models.

One of the three overall effect sizes assessing the effect of negative feedback compared to positive feedback on pressure or tension was in a negative direction, and one was in a positive direction. One of the effects was zero. Effects ranged from $d = -0.73$ to

0.73. The weighted average d was -0.04 (95% CI = -0.32, 0.24) under a fixed-error model and -0.01 (95% CI = -0.86, 0.85) under a random-error model, $Q(2) = 18.58$, $p < .001$. Trim-and-fill analyses indicated that no additional effects needed to be imputed under both FE or RE models.

Next, moderators of the effect of negative feedback compared to positive feedback were assessed for intrinsic motivation and perceived competence outcomes. I did not conduct moderator analyses for the outcomes of unspecified general motivation, effort/importance, autonomy, and pressure/tension due to the small number of contributing studies for these outcomes. Also, there was little variability among the moderators for meaningful comparisons. A small number of effect sizes contributing to group effect raised concern about the stability of the weighted average effects. Although I did not test for moderators for the effect of negative feedback on outcomes other than intrinsic motivation and perceived competence, I suspect that the pattern of findings would be similar to that found for intrinsic motivation.

MODERATOR ANALYSES FOR NEGATIVE FEEDBACK COMPARED TO POSITIVE FEEDBACK ON INTRINSIC MOTIVATION AND PERCEIVED COMPETENCE

I conducted moderator analyses of the effect of negative feedback compared to positive feedback on intrinsic motivation and perceived competence using moderators of theoretical and methodological interest. Table 3 and 4 presents these results. Moderators included publication status, feedback characteristics, task characteristics, sample characteristics, and methodological factors. I could not test characteristics of the

evaluator because evaluators were almost always researchers and did not report adequate

information on the evaluator.

Publication status

First, I examined the association between the magnitude of effect sizes on

intrinsic motivation and the publication status of the study report. Effects from published

reports ($k = 43$; FE: $d = -0.29$, 95% CI = -0.35, - 0.23; RE: $d = -0.40$, 95% CI = -0.58, -

0.22) were significantly different that those from unpublished sources ($k = 25$; FE: $d = -$

0.45, 95% CI = -0.52, -0.37; RE: $d = -0.50$, 95% CI = -0.70, -0.30) under a fixed-error

model, $Q(1) = 9.36$, $p < .001$, but not a random-error model, $Q(1) = 0.51$, $p = .48$. The

result that the effect was larger for unpublished studies reveals a lack of publication bias

as published studies are thought to have stronger effects.

For perceived competence, effects from published reports ($k = 13$; FE: $d = -0.94$,

95% CI = -1.05, -0.82; RE: $d = -0.94$, 95% CI = -1.37, -0.51) were not significantly

different that those from unpublished sources ($k = 12$; FE: $d = -1.12$, 95% CI = -1.28, -

0.95; RE: $d = -1.21$, 95% CI = -1.60, -0.83) under both a fixed-error model, $Q(1) = 3.03$,

$p = .08$, and a random-error model, $Q(1) = 0.85$, $p = .36$.

Feedback characteristics

The next set of moderators examined the effect size differences for the following

variables: mode, public versus private delivery, objective versus normative standard,

motivational features, and authentic versus manipulated feedback. The level, quantity,

and timing of the feedback were theoretical moderators that were unable to be examined due to the lack of variation of these variables among studies. Nearly all studies included feedback targeted at the task level with a dosage of one feedback that occurred immediately or not too long after the task. In addition, whether participants were told or not they would be receiving feedback was inconsistently reported in the included studies. Therefore, I was unable to test this moderator. With such little variance among these moderators, meaningful tests could not be conducted.

Feedback mode

For the feedback mode moderator, I excluded two studies (Tang, 1990; Butler, 1989) because there was insufficient detail to determine the standard to which the feedback was being compared with. Another study (Bracken, 2004) compared both modes and contributed two separate effect sizes. Studies were divided into three groups on the basis of the mode of the feedback: auditory feedback that mainly consisted of verbal feedback; visual feedback that consisted of written feedback, a numerical score, or a visual chart or diagram; or a combination of both auditory and visual modalities. As an example of this third category, Schneider (1972) provided participants with verbal feedback on their performance in addition to a card that revealed their objective score and how well they did respective to their peers. I first tested whether there were differences among the three mode types: auditory feedback ($k = 40$) visual feedback ($k = 25$), and feedback with both modes ($k = 2$). Under both fixed and random-error assumptions,

compared to positive feedback, the average weighted effect of negative feedback did not differ by mode (FE: $Q(2) = 3.36$, $p = .19$, RE: $Q(2) = 1.06$, $p = .59$).

For perceived competence, there was significant differences between the three feedback mode groups as well, but only under fixed-error assumptions, $Q(2) = 46.82$, $p < .001$, not random-error assumptions, $Q(2) = 0.29$, $p = .87$. I then ran pairwise comparisons between each feedback mode. The largest effect was for visual negative feedback ($k = 7$; $d = -1.50$, 95% CI = -1.70, -1.31), which significantly differed from both auditory negative feedback ($k = 16$; $d = -0.92$, 95% CI = -1.04, -0.80; $Q(1) = 25.36$, $p < .001$), and negative feedback with auditory and visual elements ($k = 2$; $d = -0.34$, 95% CI = -0.63, -0.04; $Q(1) = 41.77$, $p < .001$). Auditory feedback had significantly larger effect than feedback that combined both modes, $Q(1) = 12.69$, $p < .001$.

Public versus private

The next distinction I assessed was whether the feedback receiver was aware that another individual knew his/her performance evaluation (public) or if the feedback was delivered in such a way that the feedback receiver believed only he or she knew (private). Therefore, if an experimenter verbally provided the feedback to the participant, I identified this to be a public delivery; in contrast, if the participant received feedback from a computer screen, I categorized this as a private delivery. One study (Badami, 2001) was excluded because it did not report the delivery of the feedback. The moderator analyses revealed that private negative feedback ($k = 11$; FE: $d = -0.49$, 95% CI = -0.59, -0.39, RE: $d = -0.58$, 95% CI = -0.88, -0.28) had a significantly different effect than public

negative feedback ($k = 56$; FE: $d = -0.31$, 95% CI = -0.36, -0.25, RE: $d = -0.41$, 95% CI = -0.57, -0.25) when compared to positive feedback under fixed error assumptions, $Q(1) = 9.24$, $p < .001$, but not under random error assumptions, $Q(1) = 0.94$, $p = .33$.

For perceived competence, there were no significant differences between private and public feedback, FE: $Q(1) = 0.01$, $p = .92$, RE: $Q(1) = 0.38$, $p = .54$. Compared to positive feedback, receiving private negative feedback ($k = 4$; FE: $d = -1.01$, 95% CI = -1.16, -0.86, RE: $d = -0.83$, 95% CI = -1.71, 0.05) had a statistically similar effect to receiving public negative feedback ($k = 20$; FE: $d = -1.00$, 95% CI = -1.12, -0.87, RE: $d = -1.13$, 95% CI = -1.44, -0.82).

Normative versus objective standard

For feedback standard moderator analysis. I excluded four studies because they did not specify the standard of feedback (Tang, 1991; Vallerand & Reid, 1984; Viciana, 2007; Woodcock, 1990). One study (Dyck, 1979) included both kinds and contributed two effect sizes. The average weighted effect of negative feedback compared to positive feedback on intrinsic motivation varied whether feedback was normative, objective, or a combination of normative and objective under fixed-error assumptions, $Q(2) = 27.98$, $p < .001$, but not under random-error assumptions, $Q(2) = 3.15$, $p = .21$. I then proceeded to conduct pairwise comparison under fixed-effects assumptions only. The largest of the three types was for feedback that contained both normative and objective statements ($k = 17$; $d = -0.57$, 95% CI = -0.68, -0.47). Feedback with both normative and objective standards had significantly more negative effect on intrinsic motivation than normative

feedback (k = 14; d = -0.39, 95% CI = -0.48, -0.29), $Q(1)$ = 7.47, p < .05, and objective

feedback (k = 34; d = -0.23, 95% CI = -0.30, -0.16), $Q(1)$ = 27.10, p < .001. Normative

feedback was significantly different from objective feedback, $Q(1)$ = 6.82, p = .009.

For the perceived competence outcome, I excluded three samples because they

did not specify the standard of feedback (Vallerand & Reid, 1984; two samples from

Woodcock, 1990). Variation in feedback standards were significantly different from each

other under fixed-error assumptions, $Q(2)$ = 37.55, p < .001, but not under random-error

assumptions, RE: $Q(2)$ = 0.01, p = 1.00. I then ran pairwise comparisons between each

feedback standard under fixed-effects assumptions only. The effect of negative feedback

with normative standards (k = 3; d = -1.50, 95% CI = -1.71, -1.29) was significantly

larger than negative feedback with objective standards (k = 8; d = -0.66, 95% CI = -0.83,

-0.49), $Q(1)$ = 37.43, p < .001 and negative feedback with both objective and normative

standards (k = 11, d = -0.96, 95% CI = -1.12, -0.81), $Q(1)$ = 16.71, p < .001. For

perceived competence, feedback with objective standards also significantly varied from

feedback with a combination of objective and normative standards, $Q(1)$ = 6.60, p < .01.

Feedback with motivation features

Next, I assessed whether there were differences between feedback that included

motivational features such as attributions towards ability or effort, controlling or

autonomy-supportive language, and instruction. Some studies combined multiple

motivational features such as instruction and controlling language (Lim, 2005). In these

cases, this effect size was used twice but excluded when examining the specific pairwise

comparison of the two motivation features. I was interested in negative feedback that included praise; however, only one study assessed this, and could not be meaningfully added as a moderator (May, 1971). I also compared these types of feedback with feedback that did not include any motivation features as a control comparison. This kind of feedback consisted of evaluations that were void of any of the motivation features discussed above; for example, providing the participants a score of their performance as satisfactory or not.

The average weighted effect of negative feedback compared to positive feedback significantly varied for different types of motivation features under fixed-error assumptions, $Q(5) = 62.9$, $p < .001$, but not under random-error assumptions, $Q(5) = 2.77$, $p = .74$. I then proceeded to conduct pairwise comparison under fixed-effects assumptions only. The only positive effect was for instructional feedback ($k = 6$; $d = 0.23$, 95% CI $= 0.07, 0.39$). The effect of negative feedback that contained suggestions for improvement was significantly larger than the effect of general comparison feedback ($k = 53$; $d = -0.40$, 95% CI $= -0.45, -0.34$), $Q(1) = 54.06$, $p < .001$, ability feedback ($k = 5$; $d = -0.41$, 95% CI $= -0.61, -0.22$), $Q(1) = 25.55$, $p < .001$, effort feedback ($k = 5$; $d = -0.58$, 95% CI $= -0.84, -0.33$), $Q(1) = 28.43$, $p < .001$, controlling feedback ($k = 2$; $d = -0.68$, 95% CI $= -1.08, -0.28$), $Q(1) = 17.27$, $p < .001$, and autonomy-supportive feedback ($k = 4$; $d = -0.61$, 95% CI $= -0.99, -0.23$), $Q(1) = 15.77$, $p < .001$. There were no other significant pairwise comparisons.

For perceived competence, there were only two types of feedback with enough contributing effect sizes to conduct moderator analyses in addition to the general

comparison feedback (k = 18) without any motivation features: ability-focused feedback (k = 5) and instructional feedback (k = 2). Variation between these three feedback groups were significantly different from each other under fixed-error assumptions, $Q(2) = 28.41$, $p < .001$, but not under random-error assumptions, RE: $Q(2) = 1.00$, $p = .61$. I then ran pairwise comparisons between each feedback group under fixed-effects assumptions only. There were significant differences between the general comparison feedback (d = - 1.14, 95% CI = -1.25, -1.02) and ability feedback (d = -0.63, 95% CI = -0.84, -0.43), $Q(1) = 17.63$, $p < .001$, and between the general comparison feedback as instructional feedback (d = -0.40, 95% CI = -0.75, -0.05), $Q(1) = 15.24$, $p < .001$. Instructional feedback did not differ from ability feedback, $Q(1) = 1.27$, $p = .26$.

Authentic versus manipulated

Studies were divided in two groups, whether the experiment manipulated the performance evaluation or provided bogus feedback to the participant in order to induce negatively-valenced feedback, or feedback that was authentic to the performance of the participant. Compared to positive feedback, manipulated negative feedback (k = 61; FE: d = -0.38, 95% CI = -0.43, -0.33, RE: d = -0.47, 95% CI = -0.61, -0.32) had a significantly larger effect on intrinsic motivation than authentic negative feedback (k = 7; FE: d = - 0.11, 95% CI = -0.26, 0.05, RE: d = -0.18, 95% CI = -0.57, 0.20), under fixed error assumptions, $Q(1) = 10.21$, $p < .001$, but not under random error assumptions, $Q(1) = 1.80$, $p = .18$.

Under fixed- and random-error assumptions, the effect of negative feedback on perceived competence was significantly larger when the feedback was manipulated ($k = 22$) compared to when the feedback was authentic ($k = 3$) to the performance, FE: $Q(1) = 75.75$, $p < .001$, RE: $Q(1) = 12.78$, $p < .001$. When feedback was manipulated, the weighted average effect of negative feedback compared to positive feedback on perceived competence was -1.20 (95% CI = -1.31, -1.09) under fixed effects and -1.21 (95% CI = -1.49, -0.94) under random effects. When feedback was authentic, the weighted average effect of negative feedback compared to positive feedback on perceived competence was -0.07 (95% CI = -0.30, 0.17) under fixed effects and -0.16 (95% CI = -1.44, -0.82) under random effects.

Task characteristics

The next set of moderators examined the effect size differences for the following task characteristics: task type and task interestingness. The task difficulty level was unable to be examined due to the lack of variation of task difficulty among studies.

Type

I divided the studies into four groups based on the task the participants engaged in as well as the activity the feedback was evaluating. The five groups were cognitive/verbal tasks ($k = 40$), math tasks ($k = 2$), spatial tasks ($k = 12$), content tasks ($k = 3$), and physical tasks ($k = 11$). Cognitive- or verbal-related tasks included puzzles, or creativity tasks or word-related puzzles such as anagrams. Spatial tasks consisted of puzzles such

as object manipulation, for example, the Soma puzzle. Math tasks mainly involved basic operations such multiplication or interpreting statistical data such as a correlation matrix. Content tasks included activities based on specific subject such as test questions on economics/business. Physical activities were sports, motor tasks, or physical tests such as balancing on a stabilometer.

The average weighted effect of negative feedback compared to positive feedback significantly varied for different types of tasks under fixed-error assumptions, $Q(4) = 77.84$, $p < .001$ and under random-error assumptions, $Q(4) = 9.78$, $p < .05$. I then proceeded to conduct pairwise comparisons under both assumptions. The effect of negative feedback on cognitive/verbal tasks (FE: $Q(4) = 9.78$, $p < .05$; RE:) was significantly different than spatial tasks (FE: $Q(1) = 30.10$, $p < .001$; RE: $Q(1) = 3.30$, $p = .07$), math tasks (FE: $Q(1) = 19.87$, $p < .001$; RE: $Q(1) = 0.26$, $p = .61$), content-related tasks (FE: $Q(1) = 22.11$, $p < .001$; RE: $Q(1) = 4.75$, $p = .03$) and marginally significant compared to physical tasks (FE: $Q(1) = 3.66$, $p = .06$; RE: $Q(1) = 0.35$, $p = .55$). The effect of negative feedback on content-related tasks was significantly different than spatial tasks (FE: $Q(1) = 53.13$, $p < .001$; RE: $Q(1) = 9.09$, $p < .001$), math tasks (FE: $Q(1) = 42.70$, $p < .001$; RE: $Q(1) = 1.09$, $p = .30$), and physical tasks (FE: $Q(1) = 26.65$, $p < .001$; RE: $Q(1) = 5.50$, $p < .05$). The effect of negative feedback on math tasks was significantly than physical tasks (FE: $Q(1) = 9.81$, $p < .001$; RE: $Q(1) = 0.18$, $p = .67$). The effect of negative feedback was also significantly different for spatial tasks compared to physical tasks, FE: $Q(1) = 6.85$, $p < .01$, RE: $Q(1) = 1.21$, $p = .27$. There was no significant pairwise comparison between math tasks and spatial tasks.

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For perceived competence, the average effect of negative feedback compared to positive feedback significantly varied for different types of tasks under fixed-error assumptions, $Q(3) = 57.74$, $p < .001$ and marginally significant under random-error assumptions, $Q(3) = 7.17$, $p < .05$. I then proceeded to conduct pairwise comparisons under both assumptions. The effect of negative feedback on content-related was significantly different than cognitive/verbal tasks (FE: $Q(1) = 22.11$, $p < .001$; RE: $Q(1) = 4.75$, $p = .03$), spatial tasks (FE: $Q(1) = 25.51$, $p < .001$; RE: $Q(1) = 5.73$, $p < .05$) and physical tasks (FE: $Q(1) = 40.41$, $p < .001$; RE: $Q(1) = 5.52$, $p < .05$). There were no significant pairwise comparisons between the other task types.

Task interestingness

Next, I examined whether task interestingness moderated the effect of negative feedback compared to positive feedback on intrinsic motivation. Although many studies did not describe whether a task was interesting or not, some studies ($k = 22$) did report that participants were engaging in a particularly interesting task. Other studies that did not report task interesting ($k = 46$) were not the ideal comparison group and do not presume to be uninteresting per se, but I still opted to conduct this moderator analysis as an exploratory step to understand the influence of this variable.

The moderator analysis revealed that the effect of negative feedback was significantly different for tasks that were identified as interesting ($d = -0.21$, 95% CI = -0.29, -0.13) compared to tasks that did not report on interestingness ($d = -0.44$, 95% CI = -0.50, -0.38), under fixed error assumptions, $Q(1) = 21.30$, $p < .001$, but not under

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random error assumptions, $Q(1) = 1.93$, $p = 0.16$. Negative feedback appears to be less demotivating when the task is identified as interesting.

For perceived competence, negative feedback on interesting tasks ($k = 10$; FE: $d = -1.40$, 95% CI = -1.54, -1.27, RE: $d = -1.41$, 95% CI = -1.83, -0.99) had a significantly larger effect than negative feedback on tasks that did not specify interestingness ($k = 15$; FE: $d = -0.59$, 95% CI = -0.73, -0.46, RE: $d = -0.78$, 95% CI = -1.08, -0.48), under both fixed error assumptions, $Q(1) = 68.16$, $p < .001$, and random error assumptions, $Q(1) = 5.72$, $p = .02$.

Sample Characteristics

The next set of moderators examined the effect size differences for the following sample characteristics: age, sex, country of origin, and individual attributes.

Age

First, I assessed whether the effect of negative feedback compared to positive feedback on intrinsic motivation was different for college students ($k = 44$) than preschool to 12th grade students ($k = 24$). Under both fixed- and random-effects assumptions, there was not a significant difference between college students (FE: $d = -0.38$, 95% CI = -0.44, -0.32, RE: $d = -0.45$, 95% CI = -0.63, -0.28) and preschool to 12th grade participants. (FE: $d = -0.31$, 95% CI = -0.39, -0.23, RE: $d = -0.41$, 95% CI = -0.64, -0.18), FE: $Q(1) = 1.83$, $p = .18$, RE: $Q(1) = 0.09$, $p = .77$. Next, I tested if there was moderation by treating age as a continuous variable. I meta-regressed age on the effect

sizes that reported ages ($k = 68$). Both under fixed and random effects, slope values for age on effect size were not significantly different from zero (FE: *beta* = -.007, $p = .37$; RE: *beta* = -0.003, $p = .45$).

For perceived competence, I found significant differences between the college student samples ($k = 21$) and preschool to 12th grade samples ($k = 4$), under both fixed-error assumptions, $Q(1) = 29.32$, $p < .001$, and random-error assumptions, $Q(1) = 4.24$, $p < .05$. There was a stronger effect for preschool to 12th grade participants (FE: $d = -1.89$, 95% CI = -2.19, -1.53, RE: $d = -1.89$, 95% CI = -2.78, -1.01) compared to college student participants. (FE: $d = -0.92$, 95% CI = -1.02, -0.81, RE: $d = -0.92$, 95% CI = -1.21, -0.62). With the whole sample of ages (preschool to college), meta-regression results supported a developmental trend under fixed (*beta* $= 0.14$, $p < .001$) and random effects (*beta* $= 0.15$, $p < .05$). This suggests that as participant age increases, the effect of negative feedback on perceived competence becomes less negative.

Sex

Second, I examined the moderator of sex of the participants in two ways. First, using studies that reported effect sizes comparing negative and positive effect sizes by sex only, I compared effect sizes for men ($k = 13$) and women ($k = 8$). Under fixed assumptions only, there was a significant differences between male participants (FE: $d = -0.59$, 95% CI = -0.73, -0.46, RE: $d = -0.64$, 95% CI = -0.88, -0.40) and female participants (FE: $d = -0.39$, 95% CI = -0.54, -0.24, RE $d = -0.48$, 95% CI = -0.92, -0.04), $Q(1) = 3.77$, $p < .05$, and not random error effects, $Q(1) = 0.41$, $p = .52$. Second, adding

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studies that used samples with both sexes and reported the percentage of male and female participants, I conducted a meta-regression assessing the influence of a sample's percentage of female participants on the effect size of negative feedback compared to positive feedback on intrinsic motivation. The slope coefficient of female percentage was -0.11 (p =.20) under fixed error assumptions and 0.03 (p = 0.92) under random error assumptions. This indicated no significant moderation of percent female on the effect of negative feedback compared to positive feedback on intrinsic motivation.

For perceived competence, there were no significant differences between the male samples (k = 4) and female samples (k = 6), under both fixed-error assumptions, $Q(1)$ = 0.29, p = .59, and random-error assumptions, $Q(1) = 0.31$, p = .58. The effect of negative feedback on perceived competence was similar for male participants (FE: d = -1.34, 95% CI = -1.64, -1.04, RE: d = -1.59, 95% CI = -2.65, -0.52) and female participants. (FE: d = -1.21, 95% CI = -1.56, -0.87, RE: d = -1.34, 95% CI = -1.64, -1.04). Meta-regression results also revealed no impact of percent female of the sample under fixed (*beta* = -0.20, p = .36) and random effects (*beta* = 0.28, p = .64).

Country origin of study

Third, I examined whether the country of the samples moderated the effect of negative feedback compared to positive feedback on intrinsic motivation. Studies were divided by U.S. sample (k = 48) or non-U.S. sample (k = 20). The non-U.S. sample included countries such as Iran, Greece, Canada, Australia, Netherlands, Korea and Taiwan. Under fixed-error assumptions, there were significant differences between U.S.

samples (FE: d = -0.31, 95% CI = -0.37, -0.25, RE: d = -0.34, 95% CI = -0.49, -0.20) and non-U.S. samples (FE: d = -0.43, 95% CI = -0.51, -0.35, RE: d = -0.68, 95% CI = -0.99, -0.36), FE: $Q(1)$ = 5.40, p = .02, and a marginally significant difference under random-error assumptions, $Q(1)$ = 3.66, p = .06. There seems to be a larger decrement in motivation for non-U.S. samples than U.S. samples.

For perceived competence, there were significant differences between U.S. samples (k = 18) and non-U.S. samples (k = 7), only under fixed-error assumptions, $Q(1)$ = 31.02, p < .001, and not random-error assumptions, $Q(1)$ = 0.83, p = .36. The weighted average effect for negative feedback for U.S. samples (FE: d = -0.80, 95% CI = -0.92, -0.68; RE: d = -0.95, 95% CI = -1.23, -0.67) was weaker than the effect for non-U.S. samples (FE: d = -1.38, 95% CI = -1.55, -1.22; RE: d = -1.30, 95% CI = -1.98, -0.61). Because studies did not consistently report the ethnicity composition of their samples, a meaningful moderator analysis could not be conducted to assess ethnicity moderation using meta-regression.

Motivational and ability attributes

I next assessed a variety of motivational and ability participant characteristics that may moderate how negative feedback influences intrinsic motivation. I examined levels of ability, self-belief, and motivation. For each comparison, all the effects across groups came from the same studies. The average effect size for high ability participants (k = 3) was significantly different from low ability participants (k = 3) under fixed error assumptions, $Q(1)$ = 42.97, p < .001, but not under random error assumptions, $Q(1)$ =

1.18, p = .28. The weighted average effect size for high ability participants was 1.29 (95% CI = 1.03, 1.56) under fixed error assumptions and 0.83 (95% CI = -0.47, 2.13) under random error assumptions. For low ability participants, the weighted average effect size was 0.09 (95% CI = -0.15, 0.33) under fixed and random error assumptions. This result suggests that negative feedback perhaps increases intrinsic motivation for high ability students.

Next, I looked at the difference between individuals with high and low self-beliefs. These beliefs include self-esteem, academic self-concept, perceived competence, and self-efficacy. The effect of negative feedback on studies with participants with high self-beliefs (k = 3; FE: d = -0.65, 95% CI = -1.08, -.23, RE: d = -0.65, 95% CI = -1.08, -.23) was compared with studies with participants with low self-beliefs (k = 3; RE: d = -0.10, 95% CI = -0.54, 0.34, RE: d = 0.19, 95% CI = -1.07, 1.45). Unlike the ability level moderation, individuals with a high level of self-belief were marginally significantly more negatively affected by negative feedback compared to individuals with a low level of self-belief under fixed error assumptions ($Q(1)$ = 3.16, p = .08), but not under random error assumptions ($Q(1)$ = 1.53, p = .22).

Lastly, I found non-significant differences between studies with high motivation samples (k = 7) compared to studies with low motivation samples (k = 7). Motivation levels included interest, achievement motivation, and autonomy. The effect of negative feedback on studies with participants with high motivation (FE: d = -0.34, 95% CI = -0.57, -0.11, RE: d = -0.43, 95% CI = -0.87, 0.00) was fairly equal with studies with participants with low motivation (k = 7; RE: d = -0.35, 95% CI = -0.60, -0.10, RE: d = -

0.49, 95% CI = -1.09, 0.11) under both sets of assumptions, FE: $Q(1) = 0.01$, $p = .94$, RE: $Q(1) = 0.02$, $p = .89$.

Methodological characteristics

The next set of moderators examined the effect size differences for the methodological characteristics. In particular, I only tested the moderation of measurement types. Other variables such as setting could not be examined as studies primarily occurred in a controlled experimental setting.

Measurement type

One effect (Anderson & Rodin, 1989) was excluded from the intrinsic motivation outcome moderator analysis because it combined measures of IM, in particular, a composite of a behavioral and self-report measure. One study (Tang, 1991) included two types of measurements and contributed two separate effect sizes. I was primarily interested in whether self-reported measures of intrinsic motivation differed from behavioral measures. Self-reported measures of intrinsic motivation included task interest, enjoyment, or willingness to engage in the task again. Behavioral measures of intrinsic motivation included free-play task persistence or free-choice decisions to engage. Therefore, I compared studies that measured self-reported IM ($k = 40$) with behavioral measures of intrinsic motivation ($k = 28$). Under fixed error assumptions, there was a significant difference between behavioral measures of IM ($d = -0.42$, 95% CI = -0.50, -0.34) and self-reported intrinsic motivation ($d = -0.32$, 95% CI = -0.38, -0.26),

$Q(1) = 3.69$, $p < .05$. Under random error assumptions, there was not a significant difference between behavioral measure of IM ($d = -0.44$, 95% CI = -0.64, -0.24) and self-reported IM ($d = -0.45$, 95% CI = -0.64, -0.26), $Q(1) = 0.00$, $p = .95$. This moderator analysis was not conducted on the perceived competence outcome, because all measures of perceived competence were self-reported.

OVERALL EFFECTS OF NEGATIVE FEEDBACK COMPARED TO NEUTRAL OR NO FEEDBACK

I next attend to negative feedback compared to neutral feedback or instances of no feedback. First, I examined the overall effect of negative feedback compared to neutral or no feedback on each of the motivation outcomes (see Table 5). Similarly to the comparison with positive feedback, I also explored whether there was a difference in effect for free-choice behavioral measures such as task persistence during free play and non-free-choice behavioral measures such as task persistence during the activity. Moderator analyses revealed that there was no significant difference between free-choice behavioral measures and non-free-choice measures under fixed error assumptions ($Q(1) = 0.00$, $p = .96$) or under random error assumptions ($Q(1) = 0.02$, $p = .88$). Despite the lack of variation between these two outcomes, I separated them to remain consistent with theory as well as with the previous analysis.

Of the 38 overall effect sizes, 17 were in a positive direction and 17 in a negative direction. Four effects were zero. The effects ranged from $d = -1.74$ to 1.43. Under a fixed-error (FE) model, the weighted average d was 0.06 with a 95% CI from -0.02 to

0.14. The weighted average d was 0.02 under a random-error (RE) model with a 95% CI from -0.21 to 0.25. Therefore, the hypothesis that the effect of negative feedback compared to neutral or no feedback on motivation is equal to zero was supported under both FE and RE models. In addition, the tests of the distribution of the effect sizes revealed that I could reject the hypothesis that the effects were estimating the same underlying population value, $Q(37) = 263.99, p < .001$.

Trim-and-fill analyses found evidence that effect sizes were missing. Using the fixed-effects model, I found evidence that three effect sizes might have been missing on the right side. Imputing these values would change the mean effect of negative feedback compared to no feedback to $d = .13$, (95% CI = 0.06, 0.21) under fixed effects and $d = .13$, (95% CI = -0.11, 0.36) under random effects. Using the random-effects model, I found evidence that three effect sizes might have been missing on the right side. Imputing these values would change the mean effect of negative feedback compared to no feedback to $d = .13$, (95% CI = 0.06, 0.21) under fixed effects and $d = .13$, (95% CI = -0.12, 0.36) under random effects. Thus, when accounting for possible data censoring, the effect of negative feedback on intrinsic motivation compared to neutral or no feedback may actually be positive rather than having no differential effect. In addition, no outliers were detected in any of the datasets regarding no feedback.

One of the four overall effect sizes assessing the effect of negative feedback compared to neutral or no feedback on general unspecified motivation were in a negative direction, and three were in the positive direction. One effect was zero. Effects ranged from $d = -1.10$ to 0.68. The weighted average d was 0.08 (95% CI = -0.20, 0.36) under a

fixed-error model and 0.01 (95% CI = -0.76, 0.79) under a random-error model, $Q(1) =$ 22.57, $p < .001$. Trim-and-fill analyses indicated that no additional effects needed to be imputed under both FE or RE models.

Five of the eight overall effect sizes assessing the effect of negative feedback compared to neutral or no feedback on perceived competence were in a negative direction, and two were in a positive direction. One effect represented no relationship and was zero. Effects ranged from $d = -1.62$ to 1.36. The weighted average d was -0.49 (95% CI = -0.67, -0.31) under a fixed-error model and -0.52 (95% CI = -1.09, 0.05) under a random-error model, $Q(7) = 61.40$, $p < .001$. Using the fixed-effects model, I found evidence that one effect size might have been missing to the right of the mean. Imputing these values would change the mean effect of negative feedback compared to positive feedback to $d = -0.41$, (95% CI = -0.59, -0.23) under fixed effects and $d = -0.37$, (95% CI = -0.93, 0.19) under random effects. Using the random-effects model, I found evidence that no effect sizes might have been missing to the right and left of the mean. Thus, even when accounting for possible data censoring, the effect of negative feedback on perceived competence compared to no feedback is negative and significantly different from zero.

Two of the four overall effect sizes assessing the effect of negative feedback compared to neutral or no feedback on effort and importance were in a negative direction, and one was in the positive direction. One effect was zero. Effects ranged from $d = -0.85$ to 0.81. The weighted average d was -0.01 (95% CI = -0.24, 0.21) under a fixed-error model and -0.04 (95% CI = -0.68, 0.60) under a random-error model, $Q(1) = 24.15$, $p <$

.001. Trim-and-fill analyses indicated that 1 additional effect needed to be imputed under both the FE and RE models to the right of the mean, adjusting the effect size to be 0.21 (95% CI = 0.01, 0.21) under fixed effects and 0.22 (95% CI = -0.47, 0.92) under random effects.

MODERATOR ANALYSES FOR NEGATIVE FEEDBACK COMPARED TO NEUTRAL OR NO FEEDBACK CONTROL ON INTRINSIC MOTIVATION

Next, moderators of the effect of negative feedback compared to neutral or no feedback were assessed for intrinsic motivation. I assessed the same feedback, task, sample, and methodological characteristics as in the previous analysis. Similarly, I did not conduct moderator analyses for the outcomes of autonomy and pressure/tension due to the small or nonexistent number of contributing studies for these outcomes. I also did not conduct moderator analyses for the perceived competence and effort and importance outcomes because there was insufficient variability on the moderator for meaningful comparisons.

Publication status

First, I examined the association between the magnitude of effect sizes on intrinsic motivation and the publication status of the study report. Effects from published reports (k = 14; FE: d = 0.42, 95% CI = 0.29, 0.55; RE: d = 0.18, 95% CI = -0.26, 0.62) were significantly different that those from unpublished sources (k = 24; FE: d = -0.18,

95% CI = -0.28, -0.07; RE: d = -0.11, 95% CI = -0.33, 0.11) under a fixed-error model, $Q(1) = 49.48, p < .001$, but not a random-error model, $Q(1) = 1.35, p = .25$.

Feedback characteristics

The set of moderators examined the effect size differences for the following variables: mode, public versus private delivery, objective versus normative standard, motivational features, and authentic versus manipulated feedback. Similar to the comparison of negative and positive feedback, the level, quantity, expectation, and timing of the feedback were theoretical moderators that were unable to be examined due to the lack of variation of these variables among studies.

Feedback mode

Regarding the feedback mode comparisons, I excluded one study (Butler, 1989) due to lack of reporting. For negative feedback compared to neutral or no feedback, there were significant differences between the three feedback mode groups, but only under fixed-error assumptions, $Q(2) = 32.91, p < .001$, not random-error assumptions, $Q(2) = 4.13, p = .13$. I then ran pairwise comparisons between each feedback mode only under fixed effects. The largest effect was for visual negative feedback ($k = 7$; $d = -0.35$, 95% CI = -0.49, -0.21), which significantly differed from auditory negative feedback ($k = 28$; $d = 0.17$, 95% CI = 0.06, 0.28; $Q(1) = 32.62, p < .001$). Negative feedback with both auditory and visual elements ($k = 2$; $d = -0.13$, 95% CI = -0.46, 0.19) did not differ from auditory feedback, $Q(1) = 2.97, p = .08$, nor visual feedback, $Q(1) = 1.50, p = .22$.

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Public versus private

Moderator analyses revealed that private negative feedback ($k = 5$; FE: $d = -0.25$, 95% CI = -0.41, -0.09, RE: $d = -0.23$, 95% CI = -0.44, -0.03) had a significantly different effect than public negative feedback ($k = 33$; FE: $d = 0.17$, 95% CI = 0.07, 0.26, RE: $d = 0.06$, 95% CI = -0.21, 0.34) when compared to neutral or no feedback under fixed error assumptions, $Q(1) = 20.07$, $p < .001$, and marginally under random error assumptions, $Q(1) = 2.89$, $p = .09$.

Normative versus objective standard

I excluded one study (Vallerand, 1986) that did not provide information on the feedback standard. The average weighted effect of negative feedback compared to neutral or no feedback on intrinsic motivation did significantly vary whether feedback was normative, objective, or a combination of normative and objective under fixed-error assumptions, $Q(2) = 27.92$, $p < .001$, but not under random-error assumptions, $Q(2) = 0.16$, $p = .92$. Under fixed-effects assumptions only, feedback with normative standards ($k = 18$; $d = -0.04$, 95% CI = -0.20, 0.11) had a significantly more negative effect on intrinsic motivation than objective feedback ($k = 14$; $d = 0.25$, 95% CI = 0.14, 0.36), $Q(1) = 9.33$, $p < .001$. There were significant comparisons with feedback with a combination of normative and objective standards ($k = 5$, $d = -0.10$, 95% CI = -0.57, -0.15) and objective feedback, $Q(1) = 24.77$, $p < .001$, and normative feedback, $Q(1) = 5.51$, $p = .02$.

Feedback with motivation features

Next, I assessed whether there were differences between feedback instances that included motivational features. Groups from the negative-positive feedback moderator analyses were included with the exception of ability-focused and controlling feedback, which had more than two contributing effect sizes. One different feature that could have been assessed was whether there was the inclusion of praise, so this was added as a moderator category. Several studies that examined multiple kinds of feedback with motivation features contributed more than one separate effect size (e.g., Lim, 2005).

The average weighted effect of negative feedback compared to neutral or no feedback significantly varied for different types of motivation features under fixed-error assumptions, $Q(4) = 28.90$, $p < .001$, but not under random-error assumptions, $Q(4) = 2.13$, $p = .71$. Under fixed-effects assumptions only, there were several significant pairwise comparisons. Compared to the general comparison feedback with no motivation features ($k = 26$; $d = -0.01$, 95% CI = -0.12, 0.10), there were significant differences when compared to instructional feedback ($k = 6$; $d = 0.30$, 95% CI = 0.13, 0.47), $Q(1) = 9.20$, $p < .001$) and when compared to feedback with praise ($k = 3$; $d = 0.54$, 95% CI = 0.29, 0.80), $Q(1) = 15.08$, $p < .001$). Feedback with praise also significantly differed from autonomy-supportive feedback ($k = 5$; $d = -0.26$, 95% CI = -0.58, 0.06), $Q(1) = 14.58$, $p < .001$) and from effort feedback ($k = 2$; $d = -0.30$, 95% CI = -0.72, 0.13), $Q(1) = 10.98$, $p < .001$). Instructional feedback had a significantly more positive effect when compared to effort feedback, $Q(1) = 6.55$, $p < .01$, and when compared to autonomy feedback, $Q(1) =$

9.12, $p < .001$. There were no other significant pairwise comparisons among motivation features.

Authentic versus manipulated

Compared to no feedback, manipulated negative feedback ($k = 34$; FE: $d = -0.04$, 95% CI = -0.13, 0.04, RE: $d = -0.08$, 95% CI = -0.30, 0.15) had a significantly smaller effect on intrinsic motivation than authentic negative feedback ($k = 4$; FE: $d = 0.87$, 95% CI = 0.63, 1.11, RE: $d = 0.92$, 95% CI = 0.13, 1.70), under fixed error assumptions, $Q(1)$ = 48.01, $p < .001$, and under random error assumptions, $Q(1) = 5.72$, $p < .001$. Similar to the comparison of negative feedback and positive feedback, authentic negative feedback when compared to neutral or no feedback has a much less negative impact (in fact, positive) on motivation than manipulated feedback.

Task characteristics

The next set of moderators examined the effect size differences for the following task characteristics: task type and task interestingness. The task difficulty level was unable to be examined due to the lack of variation of task difficulty among studies.

Type

I next divided the studies into four groups based on the task the participants engaged in as well as the activity the feedback was evaluating. The four groups were cognitive/verbal tasks ($k = 12$), spatial tasks ($k = 11$), math tasks ($k = 3$), and physical tasks ($k = 12$). The average weighted effect of negative feedback compared to positive

feedback significantly varied for different types of tasks under fixed-error assumptions, $Q(3) = 22.77, p < .001$ but not under random-error assumptions, $Q(3) = 2.37, p = .50$. I then proceeded to conduct pairwise comparisons under just fixed-error assumptions. The effect of negative feedback on cognitive/verbal tasks (FE: $Q(4) = 9.78, p < .05$; RE:) was significantly different than spatial tasks ($Q(1) = 5.24, p < .05$), math tasks ($Q(1) = 18.18$, $p < .001$), content-related tasks (FE: $Q(1) = 22.11, p < .001$; RE: $Q(1) = 4.75, p = .03$) and physical tasks ($Q(1) = 8.27, p < .001$). There were no other significant pairwise comparisons between task types.

Task interestingness

The moderator analysis revealed that the effect of negative feedback was significantly different for tasks that were identified as interesting ($k = 17$, FE: $d = 0.09$, 95% CI = -0.06, -0.15; RE: $d = -0.25$, 95% CI = -0.55, 0.05) compared to tasks that did not report on interestingness (FE: $d = 0.21$, 95% CI = 0.09, -0.33; RE: $d = 0.09$, 95% CI = -0.23, 0.42), under fixed error assumptions, $Q(1) = 24.69, p < .001$, but not under random error assumptions, $Q(1) = 2.35, p = 0.13$. Similar to the comparison between negative and positive feedback, when compared with neutral or no feedback, negative feedback has a more positive effect when the task is identified as interesting.

Sample Characteristics

The next set of moderators examined the effect size differences for the following sample characteristics: age, sex, and country of origin. There was not sufficient variability among effect sizes to assess individual attributes as moderators.

Age

First, I assessed whether the effect of negative feedback compared to neutral or no feedback on intrinsic motivation was different for college students ($k = 24$) than preschool to 12th grade students ($k = 16$). Under both fixed-error assumptions, there was a significant difference between college students (FE: $d = -0.16$, 95% CI = -0.26, -0.06, RE: $d = -0.16$, 95% CI = -0.42, 0.09) and preschool to 12th grade participants. (FE: $d = 0.32$, 95% CI = 0.20, 0.43, RE: $d = 0.16$, 95% CI = -0.20, 0.52), FE: $Q(1) = 35.31$, $p < .001$, RE: $Q(1) = 2.02$, $p = .16$. Next, I tested if there was moderation by treating age as a continuous variable. Using the mean age when reported or averaging the age when a range was reported, I meta-regressed age on the effect sizes that reported ages ($k = 38$). Both under fixed and random effects, slope values for age on effect size were significantly different from zero (FE: *beta* = -.06, $p < .001$, RE: *beta* = -.04, $p = .10$). This result suggests that as age increases, the effect of negative feedback compared to no feedback is slightly more demotivating.

Sex

Second, I examined the moderator of sex of the participants in two ways. First, using studies that reported effect sizes comparing negative and no feedback by sex, I compared effect sizes for men ($k = 8$) and women ($k = 6$). Similarly to the comparison of negative and positive feedback, under both fixed- and random-error assumptions, there were no significant differences between male participants (FE: $d = 0.08$, 95% CI = -0.18, 0.35, RE: $d = 0.01$, 95% CI = -0.55, 0.58) and female participants (FE: $d = -0.01$, 95% CI = -0.32, 0.30, RE: $d = 0.03$, 95% CI = -0.34, 0.40), FE: $Q(1) = 0.19$, $p = .66$, RE: $Q(1) = 0.00$, $p = .96$. Results from the meta-regression assessing the influence of a sample's percentage of female participants on the effect size of negative feedback compared to neutral or no feedback were not significant under fixed or random effects (FE: *beta* = -0.16, $p = .71$; RE: *beta* = -0.07, $p = .67$).

Country origin of study

Third, there were significant differences between U.S. samples ($k = 30$) and non-U.S. samples ($k = 8$), only under fixed-error assumptions, $Q(1) = 43.47$, $p < .001$, and not random-error assumptions, $Q(1) = 2.17$, $p = .14$. The weighted average effect for negative feedback compared to neutral or no feedback for U.S. samples (FE: $d = -0.16$, 95% CI = -0.26, -0.05; RE: $d = -0.09$, 95% CI = -0.31, 0.13) was more negative than the effect for non-U.S. samples (FE: $d = 0.41$, 95% CI = 0.27, 0.54; RE: $d = 0.35$, 95% CI = -0.20, 0.89).

Methodological characteristics

The last set of moderators examined the effect size differences for the methodological characteristics. In particular, I only tested the moderation of measurement types. Other variables such as setting were not examined.

Measurement type

I excluded one study that used a composite of behavioral and self-report (Anderson & Rodin, 1989). I compared studies that measured self-reported IM ($k = 17$) with behavioral measures of IM ($k = 20$). Under fixed error assumptions, there was not a significant difference between behavioral measures of IM ($d = 0.07$, 95% CI = -0.07, 0.21) and self-reported IM ($d = 0.04$, 95% CI = -0.07, 0.14), $Q(1) = 0.15$, $p = .70$. Under random error assumptions, there was also not a significant difference between behavioral measure of IM ($d = 0.07$, 95% CI = -0.13, 0.28) and self-reported IM ($d = -0.11$, 95% CI = -0.50, 0.29), $Q(1) = 0.64$, $p = .42$.

RELATIONS BETWEEN MODERATOR VARIABLES

The moderator analyses revealed a number of significant predictors (at least under fixed effects) of the relationship between negative feedback and motivation and perceived competence. Because I tested each moderator separately, there is a possibility that moderators were confounded with one another. For example, although whether feedback is public or private and the feedback mode were found to be significant moderators individually, it is likely that private feedback is given visually instead of

aurally because most auditory feedback was spoken by an experimenter. Therefore, I examined the pairwise relationship between the significant moderator variables: publication status, feedback mode, feedback standard, feedback type, authenticity, task, task interestingness, country of origin, and participant age group, and measurement type. Chi-square tests were conducted since all variables assessed were categorical. Other moderators such as motivation orientation of the individual had two little contributing effect sizes for chi-square analyses and were not included. I combined the studies from the positive feedback comparison and the neutral or no feedback condition that measured intrinsic motivation. The results of all tests are reported in Table 7.

Analyses revealed several clusters of confounded variables with a conservative p value of .01. First, as hypothesized, I found that public feedback was more likely to be auditory or spoken to the feedback receiver, and private feedback was more likely to be visual, χ^2 (2, N = 80) = 25.32, p < .001. Second, it appears that the feedback standard moderator was confounded with task interestingness, country of origin, and measurement type. Objective feedback tended to co-occur with tasks that were not reported as interesting, χ^2 (2, N = 78) = 13.45, p < .001; non-US samples seemed to receive less normative feedback, χ^2 (2, N = 78) = 10.18, p = .006; studies using normative feedback used more behavioral measures of intrinsic motivation, χ^2 (2, N = 78) = 12.43, p = .002. Types of task were found to be confounded with interestingness, χ^2 (3, N = 83) = 13.77, p = .003. Physical tasks were identified as more interesting whereas spatial tasks tended to not be identified as interesting. Another factor associated with type of measurement of IM was age group, χ^2 (1, N = 83) = 10.15, p < .001, and authenticity of the feedback, χ^2

$(1, N = 83) = 7.11, p = .008$. Compared with studies that use behavioral measures of IM, it appears that self-report measures were more common in studies using college-age participants and in studies that implement authentic feedback, versus manipulated feedback.

ANALYSES COMPARING DIFFERENT FORMS OF NEGATIVE FEEDBACK: FEEDBACK CHARACTERISTICS

I was also interested in comparing the effects of different kinds of negative feedback on intrinsic motivation and perceived competence. This comparison would help elucidate what kind of negative feedback is the most motivating and least motivating. For these analyses, I limited the sample of studies to those that compared the effects of two or more different kinds of negative feedback. Due to small number of studies that contributed effect sizes for intrinsic motivation, I limited the comparisons to: instructional vs. non-instructional ($k = 7$), ability-focused vs. effort-focused ($k = 3$), task-focused versus process-focused ($k = 2$), threatening vs. non-threatening ($k = 6$), and "wise" vs. "unbuffered" ($k = 4$). "Wise" feedback (see Cohen, 1998; Yeager et al., 2014) involves high standards and assurance to the feedback receiver to try harder. Unbuffered criticism lacks such high standards and assurance and solely provides the instructional feedback common to both conditions. For perceived competence, I looked at instructional vs. non-instructional ($k = 3$) and threatening vs. non-threatening ($k = 3$). See Table 12 for results and examples of the various forms of negative feedback.

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First, the average weighted effect of instructional versus non-instructional feedback on intrinsic motivation was 0.88 (95% CI = 0.67, 1.09) under fixed-error assumptions and 0.98 (95% CI = 0.34, 1.61) under random-error assumptions. Second, I examined negative feedback that was focused on the ability of the participants versus the effort the participant exerted. The effect of ability versus effort negative feedback was -0.14 (95% CI = -0.49, 0.20) for both fixed and random effects. Third, I compared task-focused feedback, which evaluates the product or performance, to process-focused feedback which evaluates the strategy or approach used for the task. The average weighted difference between task-focused versus process-focused feedback was 0.02 (95% CI = -0.36, 0.40) and -0.01 (95% CI = -0.62, 0.60) under fixed- and random-error assumptions respectively. Fourth, the effect of threatening versus non-threatening negative feedback was -0.24 (95% CI = -0.48, -0.01) for fixed effects and -0.33 (95% CI = -0.87, 0.22) for random effects. Fifth, I explored the impact of "wise" feedback or feedback that conveys respect as an individual and not judgment in light of a negative stereotype. Wise feedback included high expectations for the students whereas the comparison condition ("unbuffered") just provided feedback that was intended to help. The average weighted effect of "wise" feedback versus unbuffered feedback was 0.46 (95% CI = 0.04, 0.88) for fixed- and random-error assumptions. Lastly, I compared the impact of controlling negative feedback and non-controlling feedback. Controlling language consists of using words like "should" or "must," and subsequently reduces one's sense of autonomy. The average weighted effect of non-controlling feedback versus

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controlling feedback was 0.39 (95% CI = 0.12, 0.66) for fixed-error assumptions and 0.26 (95% CI = -0.40, 0.92) for random-error assumptions.

For perceived competence, I see a similar effect comparing instructional negative feedback to non-instructional feedback ($k = 2$). The average weighted effect with both fixed- and random-error assumptions is 0.56 (95% CI = 0.10, 1.02). Instruction associated with negative feedback, not only is a motivating feature, but also raises one's perceived competence, perhaps because there is a provided opportunity to be competent with a new strategy or process.

Two studies also assessed negative feedback with and without rewards on intrinsic motivation (Lee, 1982; Pretty, 1984). Therefore, I tested whether the presence or absence of reward influenced the magnitude of the effect of negative feedback on motivation. The average weighted effect of negative feedback without compared to with rewards was -0.28 (95% CI = -0.72, 0.16) under fixed and random effects. Interestingly, the presence of rewards in combination with negative feedback increased intrinsic motivation, which is typically thought of to undermine motivation, or what self-determination and previous research on rewards (Deci et al., 1999) would predict.

In summary, negative feedback that is instructional, autonomy-supportive, non-threatening, and "wise" seemed to increase motivation compared to negative feedback without such elements. In addition, whether negative feedback targets one's ability or effort and the distinction between task- or process-focused feedback, does not seem substantially change one's motivation for the activity. In addition, informational negative

feedback and negative feedback coupled with rewards bolsters perceived competence in comparison to negative feedback without instructional details and rewards, respectively.

Chapter Five: Discussion

The results of this meta-analysis suggests that negative feedback has an overall negative effect compared to positive feedback and either a positive or neutral effect when compared to neutral or no feedback on intrinsic motivation and general unspecified motivation, as well as on a number of related outcomes included perceived competence, effort and importance, and autonomy. The degree to which was participants felt pressure or tension appeared unaffected by negative feedback.

It is also important to note that some of the findings were based on small numbers of effect sizes, making it difficult to place a great deal of confidence in the direction and magnitude of the estimated effects. For a summary of moderator analyses across outcomes and comparison see Tables 8 – 11. In addition, since the inclusion criteria required some measure of a general motivation or intrinsic motivation outcome, the analyses on the related outcomes do not necessarily represent the comprehensive collection of studies and effect studies from which I can determine any patterns of results. There is possibility that if the entire literature on the effects of negative feedback on the related outcomes were included, new results may emerge. This is particularly true for the perceived competence outcome and moderators related to one's self-concept, although a good number of studies were included in this meta-analysis, there is likely a substantive literature of feedback and self-conceptual variables such a self-esteem and self-worth that were not included.

Theoretically driven moderators analyses revealed that negative feedback was less demotivating when it provided instructional strategies for improvement and when participants are engaged in content-related tasks. Moreover, feedback that is delivered in an autonomy-supportive way, non-threatening and also "wise" or providing assurance and standards for the feedback receiver seems to be a motivating factor. Negative feedback delivered to individuals with high ability is less deleterious to their motivation.

Exploratory analyses also revealed that normative feedback was less motivating and decreased perceived competence compared to objective feedback. Feedback presented in a visual way was the most harmful towards one's perceived competence. Contrary to research on sex roles (Roberts & Nolen-Hoeksema, 1994), there was limited evidence for differences in the effect of negative feedback depending on sex. Developmentally, there appears to be a slight age trend such that the detrimental effect of negative compared to positive feedback on perceived competence is buffered as one gets older; however, mixed evidence for age moderation exists for the IM outcome. Some of these findings are highlighted and discussed in further detail in line in the following section.

FIT OF DATA TO THEORETICAL PREDICTIONS

Comparison with neutral or no feedback

This meta-analysis shows no noticeable difference between receiving negative feedback and no feedback on one's motivation. Shying away from providing any feedback ("the mum effect," Tesser & Rosen, 1975) is not necessarily protecting the

feedback receiver from a loss of motivation. If anything, the feedback receiver can obtain information about his or her progress, albeit negative, towards greater goal attainment. This finding is in line with goal theory and control theory that posits all feedback even negative is beneficial. In addition, the notion that negative feedback is "better than no feedback at all" may potentially support self-verification theory. An individual may desire feedback in order to verify his or her own self-view, even if that view is negative, with the goal of maintaining logical coherence between self-perceptions and the feedback provided by experience (Swann & Read, 1981). Or perhaps goal theorists would suggest that all feedback, be it positive or negative, is information that is motivating towards one's goal progress and pursuit. However, compared to neutral or no feedback, negative feedback still moderately decreases one's perceived competence.

Perceived competence and intrinsic motivation

Motivation theorists have contended the mechanism by which feedback influences task interest and motivation. A popular pathway that has been studied involves feedback first influencing the feedback receiver's sense of perceived competence and then one's intrinsic motivation (Elliot et al., 2000; Reeve & Deci, 1996; Vallerand & Reid, 1984; 1988). Proponents of this kind of mediation suggest that positive competence feedback has been linked to perceived competence, which in turns becomes a positive predictor for motivation. Likewise, negative feedback should follow a parallel negative path. Bandura and Schunk (1981) argued that a sense of perceived competence through mastering challenges generates greater interest in the activity. Although our meta-

analysis does not directly assess this model, I find many instances when the effect of negative feedback compared to positive feedback is overwhelmingly stronger for the perceived competence outcome than the intrinsic motivation outcome. A moderator analysis supports that these two outcomes were significantly different (FE: $Q(1) = 137.89$, $p < .001$; RE: $Q(1) = 14.13$, $p < .001$). The order of magnitudes of the average weighted effect sizes for perceived competence and intrinsic motivation is evidence for the competence pathway, as the mediator has the stronger effect. This finding is in line with self-determination theory, which suggests that feedback may influence motivational outcomes via competence need satisfaction. The magnitude of effects on perceived competence and intrinsic motivation suggests a potential ordering, that negative feedback has a stronger effect on a more proximal outcome such as perceived competence and then a more distal effect on intrinsic motivation, via influencing one's sense of competence.

Type of feedback

Results from this meta-analysis suggested that instructional negative feedback whether compared to positive feedback, neutral feedback, or comparative negative feedback, had positive effects on motivation. Contrary to the seemingly negative impact criticism can have on one's motivation, constructive criticism or instructionally-relevant feedback is motivating. People may welcome negative feedback especially when it can guide decision-making or motivate behavior (Trope, 1986). This supports the self-determination perspective, as instruction can provide the means to be competent in the future hence enhancing intrinsic motivation. According to self-enhancement theory, if

people seek to be seen in positive light, temporarily receiving negative feedback to ultimately make them successful in the future is expected, thereby reducing the typical threat of negative feedback (Steele, 1990). Moreover, the powerful effect of instructional strategy when accompanying negative feedback supports control and goal theory as constructive feedback can help the feedback receiver take the next step to reach their goal.

Another need in self-determination is autonomy, and one feature of autonomy-supportive instruction is providing feedback in a private manner, which should decrease the negative effect of criticism on motivation (Ames, 1992). Public awareness feedback may lead greater external pressure and thus, a decreased internal locus of causality, sense of autonomy and motivation. Interestingly, I found the opposite result: public criticism was more motivating compared to private criticism. Perhaps awareness that others know one's negative evaluation is greater social motivation to do better or try harder next time. There is evidence that positive feedback is demotivating when presented in public (Burnett, 2002; Emmer, 1988) versus in private; however, more research needs to be done if this effect is reversed with negative feedback.

Similarly, feedback with a normative standard or feedback with both normative and objective was consistently more demotivating than objective feedback when compared with positive, neutral, or no feedback. Being compared to a peer or with a social standard can enhance or decrease intrinsic motivation depending on the feedback valence. Our results supported that negative normative feedback is more demotivating than objective feedback. Pekrun, Cusack, Murayama, Elliot and Thomas (2013) found

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that anticipating normative feedback elicited negative emotions such as hopelessness, anxiety, and shame. Although they did not assess feedback valence, just the social comparison of the feedback resulted in negative affect. In a study with college students contrasting the influence of normative and objective feedback on motivation and self-efficacy, Johnson, Turban, Pieper, and Ng (1996) found that individuals who perceived themselves as better performers in relation to others have higher task enjoyment. I extend this finding by showing that the opposite is true: those who receive negative normative feedback will see themselves as worse performers comparatively and have decreased intrinsic motivation in comparison to those who received objective feedback. Knowing how one does comparatively to others when being evaluated heightens the effect.

Another interesting feedback characteristic moderator was whether the feedback was manipulated or authentic to the performance. Overall, authentic feedback that was more accurate to task performance seemed to be more motivating compared to bogus or false feedback that was manipulated to induce failure. One explanation of this finding comes from self-verification theory (Swann, Hixon, Stein-Seroussi, & Gilbert, 1990) and self-consistency theory (Lecky, 1945), which posit that individuals prefer to be view in a manner than confirms their self-views, despite these self-views being negative. Assuming that participants have some self-awareness of their own performance, receiving feedback that is more consistent and relevant to one's performance is believed to be most motivating. This has important implications for methodological and design considerations when using feedback to induce particular motivational or emotional responses. The

degree to which the feedback is manipulated may pre-dispose a particular motivational orientation for participants.

Task

Task interestingness seems to moderate the effect of negative feedback on motivation and perceived competence in opposing directions: When a task is interesting, negative feedback compared to either positive, neutral, or no feedback may not cause as great of a decline in motivation because the receiver is potentially still interested in the stimulating task. In addition, perhaps given the highly engaging nature of interesting tasks, it may be unlikely that motivationally detrimental influences such as negative feedback may hinder motivation during an interesting task (see Patall, 2013). However, since the receiver is invested in this task, his perceived competence can be more adversely affected by negative feedback since performing well on an interesting task should be of value to him, which is in line with self-determination theory.

EXPLORATORY ANALYSES

Age effects

This meta-analysis suggests that negative feedback had a mixed effect on intrinsic motivation and perceived competence for children than for college students. Although self-determination theory makes no direct predictions regarding age moderation, previous research such as Deci et al.'s (1999) meta-analysis found that tangible rewards undermine intrinsic motivation more for children than for college students. Compared to positive

feedback, negative feedback was found to undermine perceived competence for preschool to 12th grade students more than for college students. In line with social cognitive theory, the development of one's self-efficacy or perceived competence is a function primarily of one's mastery experiences and social influences through vicarious experiences or feedback. As children are developing their sense of self-efficacy through self-referent knowledge from the environment, their sense of personal efficacy is nascent and fragile, continually being testing, evaluated, and socially compared especially in the school context (Bandura, 1981). One explanation for the strong negative effect on perceived competence is the still developing sense of efficacy children have that may be more prone to damaging criticism compared to the more robustly formed perceived competence of older college students. However, this finding needs to be further explore as I did not find a parallel effect for perceived competence when comparing negative feedback with the neutral or no feedback condition.

However, when examining the effect of negative feedback compared to neutral or no feedback on intrinsic motivation, the pattern of results was reversed. The effect for college students was more negative than for preschool to 12th grade students. One explanation is a different development of interest or intrinsic motivation than the competence pathway discussed earlier. According to many researchers, interest development (see Hofer, 2010; Krapp, 2005; Hidi & Reninger, 2006) is discussed in multiple phases but all converge around a similar trajectory of a situational-based interest leading to a more enduring personal, individual interest. Hofer (2010) argues that in particular, adolescents develop interests as the self develops and as various life phases

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emerge. Since developing one's individual interest seems further delayed than a developing sense of competence, negative feedback for older participants with a growing awareness of their interests, may be more negatively impactful. In contrast, potentially demotivating criticism may not have a strong impact for children, whose interests are not quite formed. Further research needs to be conducted on these developmental pathways of competence and motivation and how the influence of negative feedback moderates such growths, especially as there was not a parallel effect for IM when comparing negative and positive feedback.

Sex effects

I found that in general, the effect of negative feedback seemed to not vary by sex on either type of comparison feedback or outcome. The only sex effect was under fixed effects comparing negative with positive feedback on IM, where male participants experienced a larger decrement in motivation compared to female participants. This finding is contrary to previous research that found that females are more sensitive to negative feedback (Deci, Cascio, & Krusell, 1973; Vallerand & Reid, 1988), but in support of research that indicates that males may be more sensitive to negative feedback because of an inflated ego. One possible explanation for this comes from the debate regarding gender differences in the responsiveness to negative evaluation (Roberts & Nolen-Hoeksema, 1994). Men are overly zealous about their own competence and thereby may be more responsive to negative feedback as a threat to their ego (Stake, 1983). Katz, Assor, Kanat-Maymon, & Bereby-Meyer (2006) showed that among

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children, the lack of positive feedback was demotivating for boys yet motivating for girls. They cited that girls may interpret positive feedback as more controlling and less motivating. It should be noted that this gender-related pattern was based on a cursory look at a small number of studies and should be interpreted with caution.

Country effects

Our meta-analysis was restricted in fully examining how ethnicity or culture may moderate the influence of negative feedback on motivation. A related analysis contrasting U.S. with non-U.S. samples revealed negative feedback was more detrimental to one's motivation for non-U.S. samples when compared to positive feedback. Peters and Williams (2006) found that East Asians engaged in more negative self-talk, proposed to be the mechanism through which feedback is processed, perhaps in a more negative way. Interestingly, when compared to no feedback, the effect was reversed, and negative feedback had a less negative effect on one's motivation for non-U.S. samples. One explanation comes from another analysis where Peter and Williams indicated that when providing European American and East Asians with positive and negative feedback, the East Asians persisted in a physical task for the same time when receiving either positive or negative feedback. On the other hand, Europeans Americans persisted much longer during praise and were more negatively affected by the negative feedback. Due to the heterogeneity of countries represented in the non-U.S. studies, interpretations regarding individualist versus collectivistic cultures could not be inferred. Further research needs to be conducted to tease apart these effects by country origin and ethnicity.

Measurement

According to Deci et al. (1999), self-reported and behavioral measures of intrinsic motivation are likely to differ. When comparing negative feedback with neutral or no feedback, I find no difference between both kinds of measures. This is contrary to Deci et al.'s meta-analysis, but in line with other research on self-determination such as Patall et al.'s (2008) meta-analysis on choice. However, when comparing negative with positive feedback, I see a difference between self-reported and behavioral measures, with a stronger effect of negative feedback on behavioral measures of intrinsic motivation. Deci et al. argued that this is the more valid measure of intrinsic motivation, suggesting that the strong negative effect of negative feedback is reliable. However, this effect disappeared when comparing with neutral or no feedback.

I also compared free-choice behavioral measures to task persistence that was not freely chosen. The general task persistence measures had less negative effects when negative feedback was compared to positive feedback, suggesting that these two measures tap into different forms of motivation. Deci et al. (1999) argued that freely chosen behavioral measures are unobtrusive, free from the observation of researchers and the associated interpersonal and demand considerations. Further research should be conducted to contrast these kinds of motivation, and caution should be used when opting to use not-freely chosen persistence measures when assessing intrinsic motivation as they appear to be different in some contexts.

LIMITATIONS TO GENERALIZABILITY

The first limitation of this synthesis is that meta-analyses in general consist of synthesis-generated evidence, which should not be interpreted as supporting causal relationships (see Cooper, 1998). A synthesis can only establish an association between a moderator variable and the outcome, but not a causal connection. Therefore, when significant associations are found when groups of effect sizes are compared within a research synthesis, results should be interpreted and used to direct future research of these factors in a controlled design to appropriately appraise causal impact.

Second, the confounding of moderator variables makes it difficult to tease apart the moderating effect of feedback, task, sample, and methodological characteristics. For example, samples with younger participants tended to be assessed with more behavioral measures of IM than self-reported measures. Likewise, it is difficult to determine whether how private the feedback is delivered or the mode of the feedback is the true moderator as public feedback is often given through verbal or auditory means, and visual feedback is often delivered anonymously or in a private manner. In addition, a cultural confound may exist so that non-U.S. studies are less likely to provide normative feedback. Perhaps studies with non-U.S. samples are avoiding feedback that provides a negative social influence such as normative feedback, in line with a more collectivistic nature (Henderlong & Lepper, 2002). The interrelationships among moderator variables stymies our confidence to predict which moderators have a causal relationship with the effect of negative feedback and motivation. More importantly, these relations may even be spurious. Given the limitations of this and any meta-analysis to isolate the effect of

individual moderators, future research is recommended to disambiguate the unique effects of these variables.

In addition, a number of potentially interesting and theoretically relevant variables could not be examined as moderators of the effect of negative feedback. Ethnicity is one variable that has been found in previous research to moderate the effect of criticism on motivation (Cohen, 1998; Yeager et al., 2014). Also, the influence of the quantity of feedback could not be assessed as the vast majority of studies only provided feedback once. One of the most important variables that could not be examined in this meta-analysis was the relationship between the feedback receiver and giver. Evaluating the closeness and trust between feedback receiver and giver, or even characteristics of the evaluator such as expertise, were simply not reported in the primary studies. Despite the obvious effect of the source of feedback, unfortunately, lack of reporting and variability across studies prevented the testing of this moderator among the others. Clearly, future research should investigate whether these variables moderate the effect of negative feedback.

IMPLICATIONS FOR THE USE OF NEGATIVE FEEDBACK

In the real world, people are faced with providing performance evaluations, at times negative, everyday. Further, negative feedback is often used in the classroom, workplace, and athletic settings to enhance motivation and performance. It is widely accepted that feedback is a powerful influence to change behavior and improve learning.

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Despite the ubiquity of these commonly held beliefs, little empirical guidance has been available as to how negative feedback should be delivered for the greatest benefit. The results of this meta-analysis may provide some suggestions. First, receiving negative feedback and no feedback seems to have the same effect on one's motivation. Avoiding the provision of any feedback may actually be detrimental as negative feedback when compared to neutral feedback may enhance intrinsic motivation. If anything, the feedback receiver can obtain information about his or her progress, albeit negative. Second, in order to mitigate the typically harmful effects of negative feedback on motivation, including instructional strategies on how to improve one's performance is critical (see Shute, 2008). In addition, negative feedback that is considerate of the receiver's sense of autonomy, providing assurance and high standards for improved performance is preferred. Similarly, avoiding normative comparisons and instead providing objective standards may buffer negative feedbacks' undermining impact on motivation.

Chapter Six: Conclusion

Much work has been done on understanding the environmental factors that influence intrinsic motivation, in particular, the effect of praise on intrinsic motivation (Henderlong & Lepper, 2002). However, it is surprising that the effect of negative feedback has not received adequate attention. This research may help to illuminate the effects of negative feedback and allow for comparisons between the effects of negative and positive feedback on intrinsic motivation (Comer, 2007) with important implications for psychological theory as well as policy and practice across educational, work, athletic, and therapeutic contexts, among others.

More practically, this research informs teachers, employers, parents, and coaches with comprehensive evidence regarding the best practices for providing motivating and self-determining feedback. Given a strong preference to solely praise when evaluating student work (Bracken, Jeffres, & Neuendorf, 2004; Comer, 2007), teachers tend to avoid offering criticism despite its necessary instructional implications for student growth and development. Because teachers sometimes fail to provide criticism in fear of demotivating their students (Cohen, Steele, & Ross, 1999), this research provides appropriate strategies to guide evaluators in understanding what features of negative feedback are potentially motivating. For individuals in instructional and managerial roles, providing negative feedback that takes into consideration the ways to buffer negative feedback's detrimental effects are critical to enhance both motivation and performance

for all individuals.

Appendix A

Table 1: Characteristics of the Included Studies

Author (year)	Type of Document	Sample	Country	Female	Mode	Standard
Anderson (1989)	J	40 C	U	46%	A	B
Badami (2011)	J	46 C	N	100%	V	O
Bass (1986)	D	120 C	U	nr	A	O
Baumeister (1985)	J	61 C[a]	U	nr	A	N
Beckerman (1993)	M	48 C	U	46%	V	N
Bracken (2004)	J	134 C	U	72%	B	O
Butler (1986)	J	171 K	N	56%	V A A	O
Butler (1987)	J	50 K	N	47%	nr	O
Butler (1998)	J	82 K	N	42%	B	N
Cohen (1999) 1	D	34 C	U	nr	V	O
Cohen (1999) 2	D	48 C	U	nr	V	O
Cohen (1999) 3	D	48 C	U	50%	V	O
Cox (2003)	D	90 C	U	88%	A	N
Deci (1972)	C	40 C	U	63%	A	N
Deci (1973)	C	64 C	U	63%	A	N
Draper (1976)	D	48 K	U	0%	A	O
Draper (1980)	J	39 K	U	100% 0%	A	O

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Author (year)	Type of Document	Sample	Country	Female	Mode	Standard
Draper (1981)	J	24 K	U	100%	A	O
Dyck (1979)	J	90 C	U	100%	B	B O
Elkin (1998)	J	36 K	U	41%	A	O
Elliot (2000)	J	36 K 97 C	U	53%	B	B
Fong (2013)	C	40 C	U	nr	V	O
Franke (1985)	D	36 K	U	41%	V	O
Geen (1981)	J	40 C	U	100%	A	N
Goudas (2000)	J	40 C	N	nr	A	O
Grouzet (2004)	J	359 C	N	91%	V	N
Guay (2008)	J	60 C	N	58%	V	A
Harackiewicz (1984)	J	32 C	U	0%	A	N
Hodson (1990)	MT	64 C	U	50%	A	N
Hoza (2001)	J	147 K	U	0%	A	O
Jussim (1992)	J	88 C	U	60%	A	O
Kamins (1999)	J	45 K	U	50%	A	O
Karniol (1977)	J	20 K	U	50%	V	B
Koestner (1994)	J	58 C	U	58%	A	B
Landis (1991)	MT	60 C	U	45%	A	nr
Lane (1998)	J	45 C	U	58%	A	nr

Author (year)	Type of Document	Sample	Country	Female	Mode	Standard
Lee (1982)	MT	80 C	U	100%	V	B
Lim (2005)	D	K	N	49%	V	O
Lyman (1984)	J	24 K	U	29%	A	O
Marsden (1997)	D	30 C[a] 30 C	N	49%	A	O
Martens (2010)	J	92 C	N	88%	A	O
May (1971)	J	30 C	U	nr	V	O
McCaughan (1981)	J	48 K	U	100%	A	N
Meisenhelder (2002)	D	75 C	U	nr	A	B
Meserole (2000)	D	54 K	U	53%	V	O
Nichols (1991)	J	98 K	U	50%	A	B
Olson (1985)	D	74 C	U	50%	V	O
				0%		
				100%		
		42 C[c]		50%		
		32C[c]		50%		
Paquet (2000)	MT	32 C	U	67%	V	B
Paulus (1973)	J	32 C	U	50%	A	N

Author (year)	Type of Document	Sample	Country	Female	Mode	Standard
Peters (2006)	J	54 C 26 C	U	46%	V	N
Pretty (1984)	J	20 C	U	64%	A	O
Price (1998)	D	58 C	U	0%	A	O
Rattan (2012)	J	C	U	52%	V	O
Rawlins (1986)	D	K	U	0% 100%	A	N
Richards (1991)	D	78 C	U	54%	A	O
Sansone (1989)	J	C	U	50%	V	N
Scheir (1982)	J	27 C[a] 28 C	U	40%	A	B
Schneider (1972) 1	D	80 C	U	59%	B	B
Schneider (1972) 2	D	80 C	U	59%	B	B
Senko (2002)	D	138 C	U	51%	V	B
Senko (2002a)	J	111 C	U	61%	A	B
Shanab (1981)	J	40 C	U	50%	A	N
Shu (2011)	J	69 C[c]	N	66%	V	B
Singh (1985)	J	64 K[b] 64 K 64 K	N	0%	A	O
Soriano (2000)	D	44 K[a] 54 K	U	50%	A	O
Stubblebine (1998)	J	70 C 32 C 70 C 32 C	U	0% 100%	V	O

Author (year)	Type of Document	Sample	Country	Female	Mode	Standard
Tang (1990)	J	19 C 19 C 19 C	N	12%	A	O
Tang (1991)	J	120 C	U	53%	nr	nr
Tedesco (1999)	D	120 C	U	69%	A	B
Thompson (2002)	J	96 C	N	nr	V	O
Tolen (1999)	MT	64 K	U	20%	V	B
Trope (1982)	J	80 K	N	66%	A	O
Vallerand (1984)	J	56 C	U	0%	A	nr
Vallerand (1988)	J	60 C	U	50% 0% 100%	A	O
Van-Dijk (2004) 1	J	131 C	N	nr	V	O
Van-Dijk (2004) 2	J	179 C	N	nr	V	O
Venables (2009)	J	40 C	N	50%	V	O
Viciana (2007)	J	64 K	U	46%	A	nr
Wallace (2002)	J	42 C	U	46%	A	N
Whitehead (1988)	D	105 K	U	31%	B	B
Woodcock (1990)	D	80 K[d]	N	0%	A	nr
Yeager (2014)	J	44 C	U	46%	V	O
Zhao (1996)	D	103 C	U	64%	A	N

Author (year)	Authentic	Public	Task	Interesting
Anderson (1989)	M	PU	CV	I
Badami (2011)	M	nr	P	nr
Bass (1986)	M	PU	CV	I
Baumeister (1985)	M	PU	CV	I
Beckerman (1993)	M	PU	P	I
Bracken (2004)	A	PR	C	nr
Butler (1986)	A	PU	CV	nr
Butler (1987)	M	PU	CV	I
Butler (1998)	M	PU	S	nr
Cohen (1999) 1	M	PR	C	nr
Cohen (1999) 2	M	PR	C	nr
Cohen (1999) 3	M	PR	C	nr
Cox (2003)	M	PU	CV	nr
Deci (1972)	M	PU	S	I
Deci (1973)	M	PU	S	I
Draper (1976)	M	PU	CV	nr
Draper (1980)	M	PU	CV	nr

Author (year)	Authentic	Public	Task	Interesting
Draper (1981)	M	PU	CV	nr
Dyck (1979)	M	PU	CV	I
Elkin (1998)	M	PU	CV	I
Elliot (2000)	M	PR	CV	I
Fong (2013)	M	PR	M	nr
Franke (1985)	M	PR	S	nr
Geen (1981)	M	PU	CV	nr
Goudas (2000)	M	PU	P	nr
Grouzet (2004)	M	PR	CV	I
Guay (2008)	M	PR	CV	I
Harackiewicz (1984)	M	PU	CV	nr
Hodson (1990)	A	PU	S	nr
Hoza (2001)	M	PU	CV	nr
Jussim (1992)	M	PR	CV	nr
Kamins (1999)	M	PU	S	nr
Karniol (1977)	M	PU	S	nr
Koestner (1994)	M	PU	CV	I
Landis (1991)	M	PU	CV	I

Author (year)	Authentic	Public	Task	Interesting
Lane (1998)	M	PU	C	nr
Lee (1982)	M	PU	S	nr
Lim (2005)	M	PR	CV	nr
Lyman (1984)	M	PU	S	nr
Marsden (1997)	M	PU	P	nr
Martens (2010)	A	PU	CV	nr
May (1971)	M	PR	S	nr
McCaughan (1981)	M	PU	P	I
Meisenhelder (2002)	M	PU	CV	nr
Meserole (2000)	M	PU	CV	nr
Nichols (1991)	M	PU	CV	I
Olson (1985)	M	PU	S	nr
Paquet (2000)	M	PU	C	nr
Paulus (1973)	M	PU	S	nr
Peters (2006)	M	PR	P	nr
Pretty (1984)	M	PU	S	nr
Price (1998)	M	PU	P	I

Author (year)	Authentic	Public	Task	Interesting
Rattan (2012)	M	PR	M	nr
Rawlins (1986)	M	PU	P	nr
Richards (1991)	M	PU	CV	I
Sansone (1989)	M	PR	CV	nr
Scheir (1982)	M	PU	S	nr
Schneider (1972) 1	M	PU	M	nr
Schneider (1972) 2	M	PU	M	nr
Senko (2002)	M	PU	M	nr
Senko (2002a)	M	PU	CV	I
Shanab (1981)	M	PU	S	nr
Shu (2011)	M	PR	CV	nr
Singh (1985)	M	PU	S	nr
Soriano (2000)	A	PU	CV	nr
Stubblebine (1998)	A	PU	Co	nr
Tang (1990)	M	PU	CV	nr
Tang (1991)	M	PU	CV	nr
Tedesco (1999)	M	PU	CV	nr

Author (year)	Authentic	Public	Task	Interesting
Thompson (2002)	M	PR	S	nr
Tolen (1999)	M	PU	P	I
Trope (1982)	M	PU	CV	nr
Vallerand (1984)	M	PU	P	I
Vallerand (1988)	M	PU	P	I
Van-Dijk (2004) 1	M	PR	Co	nr
Van-Dijk (2004) 2	M	PR	Co	nr
Venables (2009)	M	PR	Co	nr
Viciana (2007)	M	PU	P	nr
Wallace (2002)	M	PU	CV	nr
Whitehead (1988)	M	PU	P	I
Woodcock (1990)	M	PU	CV	I
Yeager (2014)	M	PR	Co	nr
Zhao (1996)	M	PU	CV	nr

Author (year)	Motivational	Comparison	Outcome	Measure	d
Anderson (1989)	Unspec	P	IM	S	-0.15
			PC		-1.62
	A		IM		1.36
			PC		0.00
		No	IM		1.36
			PC		1.36
		N	IM		0.00
			PC		-1.36
	C	P	IM		-1.36
			PC		-1.36
Badami (2011)	Unspec	P	IM	S	-0.23
			PC		-0.80
			EI		-0.27
Bass (1986)	Unspec	P	IM	S	0.48
Baumeister (1985)	Unspec[3]	P	IM	B	-0.32
					-0.53
		N[3]			0.21
Beckerman (1993)	Unspec	P	IM	B	0.33
Bracken (2004)	AB	P	IM	S	0.11
			PC		0.26
			IM		0.24
			IM		-0.48
Butler (1986)	P	No	IM	S	1.31
Butler (1987)	I	P	IM	S	0.82
		No			1.36
Butler (1998)	Unspec	P	IM	B	-1.30
Cohen (1999) 1	W	N[6]	M	S	0.71

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
Cohen (1999) 2	W	N[6]	M	S	0.30
			EI		0.13
Cohen (1999) 3	W	N[6]	M	S	0.00
			EI		0.00
Cox (2003)	Unspec	P	IM	B	0.00
		No			0.00
Deci (1972)	Unspec	No	IM	B	-0.60
Deci (1973)	Unspec	No	IM	B	-0.60
Draper (1976)	Unspec	P	IM	B	-0.78
		No			-0.16
Draper (1980)	Unspec	P	M	B	0.00
		No			0.67
Draper (1981)	Unspec	P	M	B	-0.15
		No			0.00
Dyck (1979)	Unspec	P	IM	B	-0.45
					-0.45
Elkin (1998)	Unspec	P	IM	B	0.30
					-0.09
Elliot (2000)	Unspec	P	IM	S	-0.68
			PC		-1.29
Fong (2013)	I	N	IM	B	0.64
		Ne			0.00
	A	N			0.64
		Ne			0.00

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
Franke (1985)	Unspec	No	IM	B	-0.13
Geen (1981)	Unspec	P	IM	B	-0.47
		No			-0.47
Goudas (2000)	Unspec	P	IM	S	-0.57
			EI		0.18
			PC		-0.91
			PT		0.12
Grouzet (2004)	Unspec	P	IM	S	-0.55
			PC		-1.84
			A		-0.34
Guay (2008)	Unspec	P	IM	S	0.00
		No			0.00
Harackiewicz (1984)	Unspec	P	IM	B	-0.01
Hodson (1990)	Unspec	P	IM	B	-0.66
			IM	S	-0.50
			PC	S	-0.66
		Ne	PC	S	-0.66
Hoza (2001)	Unspec	P	IM	B	-0.90
Jussim (1992)	Unspec	P	IM	S	-0.55
			PC		-1.93
		Ne	IM		0.00
			PC		0.00
Kamins (1999)	Unspec	N[1]	IM	B	-0.34
Karniol (1977)	Unspec	P	IM	B	0.13
		Ne			-0.53

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
Koestner (1994)	Unspec	P	IM	S	0.19
Landis (1991)	Unspec	N[2]	IM	S	0.15
				B	-0.15
Lane (1998)	AB	P	M	B	0.00
			PC	S	-0.50
Lee (1982)	Unspec	P	IM	S	-1.01
			PC		-1.05
		N[3]	IM		0.28
			PC		0.87
		N[7]	IM		0.39
			PC		0.32
Lim (2005)	I	P	IM	S	-0.85
	C				-1.28
	A				-0.09
	I	No			-1.24
	C				-0.33
	A				0.07
	I	N			-0.42
	C				-1.00
	A				0.14
Lyman (1984)	Unspec	P	M	B	-1.24
			PC	S	-2.37
Marsden (1997)	Unspec	Ne	IM	S	-0.04
					0.71
Martens (2010)	I	P	IM	S	-0.17
			PC		-0.14
			A		-0.09
		Ne	IM		0.09
			PC		0.09
			A		-0.01
May (1971)	Unspec	P	M	B	-0.89
		N[3]			-1.07

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Author (year)	Motivational	Comparison	Outcome	Measure	*d*
McCaughan (1981)	Unspec	P	M	B	-0.89
Meisenhelder (2002)	Unspec	P	M	B	-1.08
			PC	S	-1.22
Meserole (2000)	Unspec	P	IM	B	-0.26
Nichols (1991)	AB	P	IM	S	0.31
	E				-0.37
Olson (1985)	C	P	IM	B	-0.12
	I				-0.89
		N			-0.49
	C	P			-0.23
	I				-0.56
		N			-0.25
	C	P			-0.02
	I				-1.40
		N			-0.77
	C	P			0.07
	I				-1.75
		N			-0.86
	C	P			-0.6
	I				-0.09
		N			0.41
Paquet (2000)	Unspec	N[1]	IM	S	0.27
Paulus (1973)	Unspec	P	IM	B	0.68
		No			0.26
Peters (2006)	Unspec	P	IM	B	-0.59
					-0.06
Pretty (1984)	A	P	IM	S	-1.87
		Ne			-0.73
		N[4]			-1.12

Author (year)	Motivational	Comparison	Outcome	Measure	d
Price (1998)	Unspec	P	IM	S	-1.10
			PC		-0.78
			EI		0.00
			PT		0.00
Rattan (2012)	I	N	M	S	0.48
			PC		0.37
Rawlins (1986)		No	IM	B	-0.55
					-0.36
Richards (1991)	Unspec		P	IM	-2.80
				PC	-1.83
			No	IM	-1.90
				PC	-1.063
	I		P	IM	-0.164
				PC	-0.30
			No	IM	-1.08
				PC	-1.09
			N^5	IM	-1.77
				PC	-0.74
Sansone (1989)	Unspec	P	IM	S	0.00
		No			-0.86
		N^5			0.00
	I	P			-0.64
		No			0.00
Scheir (1982)	Unspec	P	M	B	-0.84
					0.31
Schneider (1972) 1	Unspec	P	IM	S	-0.09
			EF		0.04
		Ne	IM		0.06
			EF		0.63
		N^3	IM		-0.44
			EF		-0.33
Schneider (1972) 2	Unspec	P	IM	S	0.37
			EF		0.42
		Ne	IM		0.50
			EF		1.01
Senko (2002)	Unspec	P	IM	S	-2.00
		Ne			-1.02

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
Senko (2002a)	Unspec	P	IM	S	-0.61
Shanab (1981)	Unspec	Ne	IM	B	0.63
		P	PC	S	-0.63
Shu (2011)	Unspec	P	IM	B	-2.91
Singh (1985)	Unspec	P	IM	B	-0.82
					-0.72
					-1.09
Soriano (2000)	Unspec	P	IM	S	-0.86
					-0.46
Stubblebine (1998)	Unspec	P	IM	S	-0.22
		N			-1.69
		P			0.72
		N			0.24
Tang (1990)	E	P	IM	B	-0.71
					-1.17
					0.94
Tang (1991)	Unspec	P	IM	S	-0.69
				B	0.43
Tedesco (1999)	AB	P	IM	S	-0.57
			PC	S	-0.46
Thompson (2002)	Unspec	P	IM	B	-1.17
Tolen (1999)	Unspec	P	IM	S	-0.06
			PC		-0.08
			EI		-0.66
		No	IM		-0.71
			PC		-0.11

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
			EI		-0.13
Trope (1982)	Unspec	P	IM	B	0.00
Vallerand (1984)	AB	P	IM	S	-0.54
			PC		-0.54
		N	IM		-0.54
			PC		-0.54
Vallerand (1988)	AB	P	IM	S	-1.13
			PC		-2.39
			IM		-1.10
			PC		-2.70
			IM		-0.96
			PC		-2.19
Van-Dijk (2004) 1	Unspec	P	M	S	0.07
Van-Dijk (2004) 2	Unspec	P	M	S	0.05
Venables (2009)	Unspec	P	M	S	-0.66
Viciana (2007)	E/AB	P	IM	S	-0.38
		N			-0.54
Wallace (2002)	Unspec	P	IM	B	0.00
		Ne			0.00
Whitehead (1988)	E	P	IM	S	-0.75
			PC		-2.14
			EI		-1.20
			PT		0.73
		No	IM		-0.61
			PC		-1.29
			EI		-0.85

Author (year)	Motivational	Comparison	Outcome	Measure	*d*
Woodcock (1990)	AB	P	IM	S	-1.06
			PC		-2.49
			EI		-0.75
			PT		-0.73
Yeager (2014)	P/I	N	M	S	0.77
Zhao (1996)	Unspec	P	IM	S	-0.49
			EI		0.47

Note. For studies in which there were a number of subgroups, both subgroup effect sizes and overall effect sizes collapsed across subgroups are presented. The overall effect sizes collapsed across subgroups appear in the top of a row for every study with multiple subgroups. The D = dissertation, J = journal article, MT = master's thesis; K = K-12 students, C = College students; U = U.S., N = non-U.S.; M = male, F = female; A = auditory, V = visual, B = both; N = normative, O = objective, B = both; A = authentic, M = manipulated; PU = public, PR = private; S = spatial, P = physical, CV = cognitive/verbal, M = math, Co = content; I = interesting, nr = not reported; I = instructional, E = effort, AB = ability, A = autonomy-supportive, P = included praise, C = controlling, Unspec = unspecified; P = positive feedback, N = negative feedback, No = no feedback, Ne = neutral feedback; IM = intrinsic motivation, M = unspecified motivation, PC = perceived competence, EI = effort and importance, PT = pressure/tension; S = self-reported, B = behavioral.

[1] Task vs. process-focused [2] Ability vs. effort-focused [3] Non-threatening vs. threatening [4] Reward vs. no reward [5] Instruction vs. no instruction [6] Wise vs. unbuffered [7] Reward vs. no reward [a] Low vs. high self-beliefs [b] Mixed vs. low vs. high SES [c] High (vs. moderate) vs. low motivation [d] High vs. low ability.

Table 2: Results of Analyses Examining the Overall Effect of Negative Feedback

Compared to Positive Feedback on All Outcomes

Outcome	k	d	95% confidence interval		Q
			Low estimate	High Estimate	
Intrinsic Motivation	68	-0.35*** (-0.44)***	-0.40 (-0.57)	-0.30 (-0.30)	497.71***
General Motivation	11	-0.21*** (-0.36)*	-0.36 (-0.67)	-0.07 (-0.05)	37.55***
Perceived Competence	25	-1.00*** (-1.06)***	-1.09 (-1.36)	-0.90 (-0.77)	203.31***
Effort/Importance	9	-0.18* (-0.23)	-0.33 (-0.58)	-0.02 (0.12)	38.26***
Autonomy	2	-0.29*** (-0.28)**	-0.47 (-0.48)	-0.10 (-0.08)	1.09
Pressure/Tension	3	-0.04 (-0.01)	-0.32 (-0.86)	0.24 (0.84)	18.58***

Note. Fixed-effects values are presented outside of parentheses and random-effects values are within parentheses.
*$p < .05$, **$p < .01$, ***$p < .001$.

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Table 3: Results of Moderator Analyses for Negative Feedback Compared to Positive

Feedback on IM

Outcome/Moderator	k	d	95% confidence interval		Q_b
			Low estimate	High Estimate	
Publication type					9.36***
					(0.51)
Published	43	-0.29*** (-0.40)***	-0.35 (-0.58)	-0.23 (-0.22)	
Unpublished	25	-0.45*** (-0.50)***	-0.52 (-0.70)	-0.37 (-0.30)	
Feedback mode					3.36
					(1.06)
Auditory	40	-0.41*** (-0.46)**	-0.48 (-0.61)	-0.34 (-0.31)	
Visual	25	-0.46*** (-0.49)***	-0.53 (-0.72)	-0.39 (-0.26)	
Combined	2	-0.21 (-0.17)	-0.49 (-0.74)	0.08 (0.41)	
Feedback standard					27.98***
					(3.15)
Objective	34	-0.23*** (-0.43)***	-0.30 (-0.63)	-0.16 (-0.23)	
Normative	14	-0.39*** (-0.25)**	-0.48 (-0.49)	-0.29 (-0.02)	
Combined	17	-0.57*** (-0.61)***	-0.68 (-0.95)	-0.47 (-0.28)	
Motivation features					63.86***
					(2.77)
Unspecified	53	-0.40*** (-0.43)***	-0.45 (-0.58)	-0.34 (-0.28)	
Instructional	6	0.23*** (-0.23)	0.07 (-0.88)	0.39 (0.41)	
Ability	5	-0.41*** (-0.47)	-0.61 (-1.01)	-0.22 (0.07)	
Effort	5	-0.58*** (-0.58)***	-0.84 (-0.84)	-0.33 (-0.33)	
Autonomy-supportive	4	-0.61*** (-0.87)**	-0.99 (-1.64)	-0.23(-0.09)	
Controlling	2	-0.68*** (-0.70)	-1.08 (-1.83)	-0.28 (0.43)	
Authentic					10.21***
					(1.80)
Authentic	7	-0.11 (-0.18)	-0.26 (-0.57)	0.05 (0.20)	
Manipulated	61	-0.38*** (-0.47)***	-0.43 (-0.61)	-0.33 (-0.32)	

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	n				
Public					9.24*** (0.94)
Public	56	-0.31*** (-0.41)***	-0.36 (-0.57)	-0.25 (-0.25)	
Private	11	-0.49*** (-0.58)***	-0.59 (-0.88)	-0.39 (-0.28)	
Task type					77.84*** (9.78)*
Cognitive/verbal	40	-0.30*** (-0.38)***	-0.35 (-0.55)	-0.24 (-0.22)	
Math	2	-0.99*** (-0.93)	-1.30 (-3.03)	-0.69 (1.16)	
Spatial	12	-0.74*** (-0.71)***	-0.88 (-1.02)	-0.59 (-0.40)	
Content	3	0.26* (0.22)	0.03 (-0.30)	0.48 (0.73)	
Physical	11	-0.45**** (-0.48)***	-0.61 (-0.75)	-0.30 (-0.21)	
Task Interestingness					21.30*** (1.93)
Interesting	22	-0.21*** (-0.29)*	-0.29 (-0.55)	-0.13 (-0.03)	
Not reported	46	-0.44*** (-0.51)**	-0.50 (-0.66)	-0.38 (-0.35)	
Age					1.83 (0.09)
K-12 students	24	-0.31*** (-0.41)***	-0.39 (-0.64)	-0.23 (-0.18)	
College students	44	-0.38*** (-0.45)**	-0.44 (-0.63)	-0.32 (-0.28)	
Gender					3.77* (0.41)
Male	13	-0.59*** (-0.64)***	-0.73 (-0.88)	-0.46 (-0.40)	
Female	8	-0.39*** (-0.48)*	-0.54 (-0.92)	-0.24 (-0.04)	
Country					5.40* (3.66)^
U.S.	48	-0.31*** (-0.34)***	-0.37 (-0.49)	-0.25 (-0.20)	
Non-U.S.	20	-0.43*** (-0.68)***	-0.51 (-0.99)	-0.35 (-0.36)	
Ability					42.97*** (1.18)
High ability	3	1.29*** (0.83)	1.03 (-0.47)	1.56 (2.13)	
Low ability	3	0.09 (0.09)	-0.15 (-0.15)	0.33 (0.33)	
Motivation					0.01 (0.02)
High motivation	3	-0.34*** (-0.43)*	-0.57 (-0.87)	-0.11 (0.00)	

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Low motivation	3	-0.35** (-0.49)	-0.60 (-1.09)	-0.10 (0.11)	
Self-Beliefs					3.16^ (1.53)
High self-beliefs	7	-0.65*** (-0.65)***	-1.08 (-1.08)	-0.23 (-0.23)	
Low self-beliefs	7	-0.10 (0.19)	-0.54 (-1.07)	0.34 (1.45)	
Measurement					3.69* (0.00)
Self-report	40	-0.32*** (-0.45)***	-0.38 (-0.64)	-0.26 (-0.26)	
Behavior	2	-0.42*** (-0.44)***	-0.50 (-0.64)	-0.34 (-0.24)	

Note. Fixed-effects values are presented outside of parentheses and random-effects values are within parentheses. *$p < .05$, **$p < .01$, ***$p < .001$. ^ $p < .10$.

Table 4: Results of Moderator Analyses for Negative Feedback Compared to Positive

Feedback on Perceived Competence

| Outcome/Moderator | k | d | 95% confidence interval | | Q_b |
			Low estimate	High Estimate	
Publication type					3.03 (0.85)
Published	13	-0.94*** (-0.94)***	-1.05 (-1.37)	-0.82 (-0.51)	
Unpublished	12	-1.12*** (-1.21)***	-1.28 (-1.60)	-0.95 (-0.83)	
Feedback mode					46.82*** (0.29)
Auditory	16	-0.92*** (-1.03)***	-1.04 (-1.33)	-0.80 (-0.74)	
Visual	7	-1.50*** (-1.18)***	-1.70 (-1.67)	-1.31 (-0.70)	
Combined	2	-0.34* (-0.93)	-0.63 (-3.28)	-0.04 (1.43)	
Feedback standard					37.55*** (0.01)
Objective	8	-0.66*** (-1.02)***	-0.83 (-1.63)	-0.49 (-0.41)	
Normative	3	-1.50*** (-1.07)*	-1.71 (-1.99)	-1.29 (-0.16)	
Combined	11	-0.96*** (-1.05)***	-1.12 (-1.33)	-0.81 (-0.76)	
Motivation features					28.41*** (1.00)
Unspecified	18	-1.14 (-1.06)	-1.25 (-1.31)	-1.02 (-0.82)	
Instructional	2	-0.40* (-0.58)	-0.75 (-1.50)	-0.05 (0.34)	
Ability	5	-0.30 (0.11)	-0.84 (-2.13)	-0.43 (-0.06)	
Authentic					75.75*** (12.78)***
Authentic	3	-0.07 (0.16)	-0.30 (-0.66)	0.17 (0.35)	
Manipulated	22	-1.20*** (-1.21)***	-1.31 (-1.49)	-1.09 (-0.44)	
Public					0.01 (0.38)
Public	20	-1.00*** (-1.13)***	-1.12 (-1.44)	-0.87 (-0.82)	
Private	4	-1.01*** (-0.83)	-1.16 (-1.71)	-0.86 (0.05)	
Task type					57.75*** (7.17)^

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Cognitive/verbal	12	-1.15*** (-1.14)	-1.27 (-1.58)	-1.02 (-0.70)	
Spatial	11	-0.99*** (-1.11)***	-1.28 (-1.54)	-0.70 (-0.68)	
Content	3	0.09 (-0.07)	-0.21 (-0.80)	0.39 (0.67)	
Physical	12	-1.12*** (-1.17)***	-1.35 (-1.71)	-0.90 (-0.62)	
Task Interestingness					68.16*** (5.72)*
Interesting	10	-1.40*** (-1.41)***	-1.54 (-1.83)	-1.27 (-0.99)	
Not reported	15	-0.59*** (-0.78)***	-0.73 (-1.08)	-0.46 (-0.48)	
Age					29.432*** (4.24)*
K-12 students	4	-1.86*** (-1.89)***	-2.19 (-2.78)	-1.53 (-1.01)	
College students	21	-0.92*** (-0.92)***	-1.02 (-1.21)	-0.81 (-0.62)	
Gender					0.29 (0.31)
Male	6	-1.34*** (-1.59)***	-1.64 (-2.65)	-1.04 (-0.52)	
Female	4	-1.21*** (-1.26)***	-1.56 (-1.70)	-0.87 (-0.82)	
Country					31.02*** (0.83)
U.S.	18	-0.80*** (-0.95)***	-0.92 (-1.23)	-0.68 (-0.61)	
Non-U.S.	7	-1.38*** (-1.30)***	-1.55 (-1.98)	-1.22 (-0.61)	

Note. Fixed-effects values are presented outside of parentheses and random-effects values are within parentheses. *$p < .05$, **$p < .01$, ***$p < .001$. ^ $p < .10$.

Table 5: Results of Analyses Examining the Overall Effect of Negative Feedback

Compared to Neutral or No Feedback on All Outcomes

Outcome	k	d	95% confidence interval		Q
			Low estimate	High Estimate	
Intrinsic Motivation	38	0.06 (0.02)	-0.02 (-0.21)	0.14 (0.25)	263.99***
General Motivation	4	0.08 (0.01)	-0.20 (-0.76)	0.36 (0.79)	22.57***
Perceived Competence	8	-0.49*** (-0.52)	-0.67 (-1.09)	-0.31 (0.05)	61.40***
Effort/Importance	6	-0.01 (-0.04)	-0.24 (0.21)	-0.68 (0.60)	24.15***

Note. Fixed-effects values are presented outside of parentheses and random-effects values are within parentheses.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 6: Results of Moderator Analyses for Negative Feedback Compared to No Neutral

Feedback on IM

| Outcome/Moderator | k | d | 95% confidence interval | | Q_b |
			Low estimate	High Estimate	
Publication type					49.48***
					(1.35)
Published	14	0.42***	0.29 (-0.26)	0.55 (0.62)	
		(0.18)			
Unpublished	24	-0.18***	-0.28 (-0.33)	-0.07 (0.11)	
		(-0.11)			
Feedback mode					32.91***
					(4.13)
Auditory	28	0.17	0.06 (-0.19)	0.28 (0.36)	
		(0.09)			
Visual	7	-0.35	-0.49 (-0.60)	-0.21 (-0.04)	
		(-0.32)			
Combined	2	-0.13	-0.46 (-1.03)	0.19 (0.71)	
		(-0.16)			
Feedback standard					27.92***
					(0.16)
Objective	14	0.25***	0.14 (-0.35)	0.36 (0.46)	
		(0.05)			
Normative	18	-0.04	-0.20 (-0.22)	0.11 (0.29)	
		(0.04)			
Combined	5	-0.36***	-0.57 (-0.75)	-0.15 (0.56)	
		(-0.10)			
Motivation features					28.90***
					(2.13)
Unspecified	26	-0.01	-0.12 (-0.20)	0.10 (0.29)	
		(0.05)			
Instructional	6	0.30***	0.13 (-0.53)	0.47 (0.68)	
		(0.07)			
Effort	2	-0.30	-0.72 (-1.40)	0.13 (1.62)	
		(0.11)			
Autonomy-supportive	5	-0.26	-0.58 (-1.05)	0.06 (0.18)	
		-0.43			
Praise	3	0.54***	0.29 (-1.36)	0.80 (1.47)	
		0.06			
Authentic					48.01***
					(5.72)*
Authentic	4	0.87***	0.63 (0.13)	1.11 (1.70)	
		(0.92)*			
Manipulated	34	-0.04	-0.13 (-0.30)	0.04 (0.14)	
		(-0.08)			
Public					20.07***
					(2.89)^

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	N				
Public	33	0.17*** (0.06)	0.07 (-0.21)	0.26 (0.34)	
Private	5	-0.25*** (-0.23)*	-0.41 (-0.44)	-0.09 (-0.03)	
Task type					22.77*** (2.37)
Cognitive/verbal	12	0.24*** (0.26)	0.12 (-0.18)	0.35 (0.71)	
Spatial	11	-0.04*** (-0.07)***	-0.24 (-0.50)	0.17 (0.37)	
Math	3	-0.28** (-0.25)	-0.48 (-1.01)	-0.07 (0.50)	
Physical	12	-0.09 (-0.11)	-0.29 (-0.38)	0.10 (0.15)	
Task Interestingness					0.24 (0.34)
Interesting	17	0.09 (-0.06)	-0.06 (-0.48)	0.23 (0.35)	
Not reported	21	0.04 (0.09)	-0.05 (-0.20)	0.14 (0.38)	
Age					27.43*** (0.61)
K-12 students	16	0.31*** (0.13)	0.18 (-0.28)	0.43 (0.53)	
College students	22	-0.13* (-0.06)	-0.24 (-0.32)	-0.02 (0.20)	
Gender					0.19 (0.00)
Male	8	0.08 (0.01)	-0.18 (-0.55)	0.35 (0.58)	
Female	6	-0.01 (0.03)	-0.32 (-0.34)	0.30 (0.40)	
Country					43.47*** (2.17)
U.S.	30	-0.16*** (-0.09)	-0.26 (-0.31)	-0.05 (0.13)	
Non-U.S.	8	0.41*** (0.35)	0.27 (-0.20)	0.54 (0.89)	
Measurement					0.15 (0.64)
Self-report	17	0.04 (-0.11)	-0.07 (-0.50)	0.14 (0.29)	
Behavior	20	0.07 (0.07)	-0.07 (0.21)	0.21 (0.28)	

Note. Fixed-effects values are presented outside of parentheses and random-effects values are within parentheses. Superscript letters denote significant pairwise comparisons. $*p < .05$, $**p < .01$, $***p < .001$

Table 7: Relations Between Moderator Variables

Moderator Variable	Measurement	Country	Task Interestingness
Age	$\chi^2 (1, N = 83) = 10.2$ $p < .001$	$\chi^2 (1, N = 83) = 0.03$ $p = .857$	$\chi^2 (1, N = 83) = 1.01$ $p = .294$
Standard	$\chi^2 (2, N = 78) = 12.4$ $p = .002$	$\chi^2 (2, N = 78) = 10.18$ $p = .006$	$\chi^2 (2, N = 78) = 13.5$ $p < .001$
Mode	$\chi^2 (2, N = 81) = 0.83$ $p = .66$	$\chi^2 (1, N = 81) = 1.38$ $p = .503$	$\chi^2 (1, N = 81) = 6.98$ $p = .03$
Motivational Features	$\chi^2 (6, N = 87) = 16.3$ $p = .012$	$\chi^2 (6, N = 87) = 9.97$ $p = .13$	$\chi^2 (6, N = 87) = 8.7$ $p = .191$
Public/Private	$\chi^2 (1, N = 82) = 2.01$ $p = .16$	$\chi^2 (1, N = 82) = 3.97$ $p < .05$	$\chi^2 (1, N = 82) = 1.65$ $p = .199$
Authentic/ Manipulated	$\chi^2 (1, N = 83) = 7.11$ $p = .008$	$\chi^2 (1, N = 83) = 0.49$ $p = .484$	$\chi^2 (1, N = 83) = 4.80$ $p = .03$
Task Type	$\chi^2 (3, N = 83) = 3.49$ $p = .322$	$\chi^2 (3, N = 83) = 0.55$ $p = .91$	$\chi^2 (3, N = 83) = 13.8$ $p = .003$
Task Interestingness	$\chi^2 (1, N = 83) = 0.07$ $p = .794$	$\chi^2 (1, N = 83) = 1.18$ $p = .28$	
Country	$\chi^2 (1, N = 83) = 2.49$ $p = .12$		

Moderator Variable	Task Type	Authentic/ Manipulated	Public/ Private
Age	$\chi^2 (3, N = 83) = 3.62$ $p = .31$	$\chi^2 (1, N = 83) = 0.40$ $p = .53$	$\chi^2 (1, N = 82) = 3.97,$ $p = .046$
Standard	$\chi^2 (6, N = 78) = 12.9$ $p < .05$	$\chi^2 (2, N = 78) = 5.06$ $p = .08$	$\chi^2 (2, N = 77) = 0.70$ $p = .71$
Mode	$\chi^2 (6, N = 83) = 13.6$ $p = .04$	$\chi^2 (2, N = 83) = 0.53$ $p = .77$	$\chi^2 (2, N = 80) = 25.3$ $p < .001$
Motivational Features	$\chi^2 (18, N = 87) = 32.7$ $p = .02$	$\chi^2 (6, N = 87) = 3.07$ $p = .800$	$\chi^2 (6, N = 86) = 8.99$ $p = .17$
Public/Private	$\chi^2 (3, N = 82) = 6.04$ $p = .110$	$\chi^2 (1, N = 82) = 0.01$ $p = .91$	
Authentic/ Manipulated	$\chi^2 (3, N = 83) = 3.58$ $p = .31$		
Task Type			
Task Interestingness			
Country			

Moderator Variable	Motivational Features	Mode	Standard
Age	$\chi^2 (7, N = 87) = 4.11$ $p = .77$	$\chi^2 (7, N = 81) = 2.31$ $p = .32$	$\chi^2 (7, N = 77) = 1.64$ $p = .44$
Standard	$\chi^2 (12, N = 83) = 24$ $p = .02$	$\chi^2 (7, N = 77) = 11.1$ $p = .03$	
Mode	$\chi^2 (14, N = 85) = 10.2$ $p = .75$		
Motivational Features			
Public/Private			
Authentic/ Manipulated			
Task Type			
Task Interestingness			
Country			

Table 8: Summary of Feedback Characteristics Moderator Effects

	Positive Feedback IM	Positive Feedback PC	Neutral/No Feedback IM
Mode	Auditory	**Auditory (-.92)**	**Auditory (.17)**
	Visual	Visual (-1.50)	Visual (-.35)
	Combined	Combined (-.34)	Combined (-.13)
Standard	**Objective (-.23)**	**Objective (-.66)**	**Objective (.25)**
	Normative (-.39)	Normative (-1.50)	Normative (-.04)
	Combined (-.57)	Combined (-.96)	Combined (-.36)
Motivation Features	Unspecified (-.40)	Unspecified (-1.14)	Unspecified (-.01)
	Instructional (.23)	**Instructional (.40)**	**Instructional (.30)**
	Ability (-.41)	Ability (-.30)	**Praise (.54)**
	Effort (-.58)		Effort (-.30)
	Autonomy (-.61)		Autonomy (-.26)
	Controlling (-.68)		
Authentic	**Authentic (-.11)**	**Authentic (-.07)**	**Authentic (.87)**
	Manipulated (-.38)	Manipulated (-1.20)	Manipulated (-.04)
Public	**Public (-.31)**	Public	**Public (.17)**
	Private (-.49)	Private	Private (-.25)

Note. Bold-faced moderators indicate the significantly more beneficial moderator for one's motivation under fixed effects. Underlined moderators are significant under random effects. Values in parentheses indicate average effect sizes under fixed effects.

Table 9: Summary of Task Characteristics Moderator Effects

	Positive Feedback	Positive Feedback	Neutral/No Feedback
	IM	PC	IM
Task	Cognitive/verbal (-30; -38) Math (-.99; -.93) Spatial (-.74, -.71) **Content (0.26, 0.22)** Physical (-.45, -.48)	Cognitive/verbal (-1.15) Spatial (-.99) **Content (.09)** Physical (-1.12)	**Cognitive/verbal (.24)** Math (-.28) Spatial (-.04) Physical (-.09)
Interesting-ness	**Interesting (-.21)** Not reported (-.44)	Interesting (-1.40; -1.41) **Not reported (-.59; -.78)**	Interesting Not reported

Note. Bold-faced moderators indicate the significantly more beneficial moderator for one's motivation under fixed effects. Underlined moderators are significant under random effects. Values in parentheses indicate average effect sizes under fixed effects.

Table 10: Summary of Sample Characteristics Moderator Effects

	Positive Feedback IM	Positive Feedback PC	Neutral/No Feedback IM
Age	K-12 Students College Students	K-12 Students (-1.86; -1.89) **College Students** **(-.92; -.92)**	**K-12 Students (.31)** College Students (-.13)
Sex	**Male (-.59)** Female (-.39)	Male Female	Male Female
Country	**U.S. (-.31)** Non-U.S. (-.43)	**U.S. (-.80)** Non-U.S. (-1.38)	U.S. (-.16) **Non-U.S. (0.41)**
Ability	**High (1.29)** Low (0.09)		
Motivation	High Low		
Self-beliefs	High Low		

Note. Bold-faced moderators indicate the significantly more beneficial moderator for one's motivation under fixed effects. Underlined moderators are significant under random effects. Values in parentheses indicate average effect sizes under fixed effects.

Table 11: Summary of Methodological Characteristics Moderator Effects

	Positive Feedback IM	Positive Feedback PC	Neutral/No Feedback IM
Measurement	Behavioral (-.42)		Behavioral
	Self-reported (-.32)		Self-reported

Note. Bold-faced moderators indicate the significantly more beneficial moderator for one's motivation under fixed effects. Underlined moderators are significant under random effects. Values in parentheses indicate average effect sizes under fixed effects.

Table 12: Summary of Different Forms of Negative Feedback and Sample Feedback
Statements

	IM	Example Feedback statements
Instructional vs. Non-instructional	.88 (.98) PC .56 (.56)	*Instructional*: "However, one useful strategy for successful performance that is often overlooked in this puzzle is to search for words that run up diagonally, from left to right" *Non-instructional*: "You found (actual number) out of (8 more than they found). Your score indicates you didn't do you very well on the puzzle" (Richards, 1991).
Ability vs. **Effort**	-.14 (-.14)	*Ability*: "Compared to other children your age, you did not do so well. Remember it is important to solve more problems correctly than anyone else your age. When you solve more problems than other kids, it makes you look real smart. You look smarter when you get more problems correct." *Effort*: "You must not have tried very hard to so poorly. Remember, the harder you try, the more you learn and the more problems you will solve. When you work very hard you get better at solving these problems" (Nichols, Whelan, & Meyers, 1985).
Task vs. Process	.02 (-.01)	*Task*: "That's not the right way to do it, because the blocks are not straightened up and are still messy." *Process*: "The blocks are all crooked and in one big mess. Maybe you could think of another way to do it" (Kamins & Dweck, 1999).
Non-threatening vs. Threatening	.24 (.33)	*Non-threatening*: "You didn't do so well I'm kind of surprised, this is one of the lowest scores I've seen since I've been administering the test Is anything bothering you—did you not get enough sleep last night, or have you been working too hard lately. I think someone told me once that this particular test might be affected by things like that." *Threatening*: You did quite badly I m surprised, this is one of the lowest scores I've seen since I've been administering the test Is some- thing wrong" (Anderson & Rodin, 1989)

Wise vs. "Unbuffered"	.46 (.46)	*Wise*: "I'm giving you these comments because I have very high expectations and I know that you can reach them." *Unbuffered*: "I'm giving you these comments so that you'll have feedback on your paper" (Yeager et al., 2014)
Non-controlling vs. Controlling	.39 (.26)	*Non-controlling*: "You need to make more effort. Try to write a more original and interesting story rather than common story that people can expect easily. Read carefully to understand a given situation correctly and try to complete it. Even if a common thing comes up to your mind first, try to think about more original and flexible ideas." *Controlling*: "Your grade results from comparing your story with other students'. After a little while, you SHOULD complete another tasks and your stories will be graded by comparing them with other students on the basis of the originality and interest. You SHOULD try as hard as possible because I expect you to perform up to standards on these tasks. It will be also identified how much your performance is improved" (Lim, 2005).
Without rewards vs. **With Rewards**	-.28 (-.28)	*n/a*

Note. Bold-faced moderators indicate the more beneficial moderator for one's motivation. Values in parentheses indicate average effect sizes under random effects; values outside parentheses indicate average effect sizes under fixed effects.

Appendix B

Search Strategy

feedback OR critici* OR critique OR (competence evaluation) OR (performance evaluation) OR (ability evaluation) OR (competence information) OR (performance information) OR (ability information) OR (performance appraisal) OR (ability appraisal) OR (competence appraisal)

AND

motivation OR interest OR self-determination OR persistence

Note: *denotes a truncation that designates any word from the root search term

Appendix C

Coding Guide

Study Information	
ST1. What was the study number? *(Used to identify reports with multiple studies)*	____
ST2. At what level were participants randomly assigned to conditions?	___ Participants were assigned to condition ___ Sessions were assigned to conditions ___ Classes/teams were assigned to condition ___ Other: _____ ___ NR

I1. Characteristics of the Negative Feedback Variable	
F1. What characteristics were used to describe the feedback?	Did the feedback include… A. Instruction for improvement ("informational" feedback, includes hints) Yes No NR B. Praise Yes No NR C. Effort attributions/reasons for performance ("you did not put in enough effort into the task") Yes No NR D. Ability attributions/reasons for performance ("you are not smart enough" Yes No NR E. Controlling language ("should", "must") Yes No NR F. Autonomy-supportive language ("could", asking questions) Yes No NR G. Objective standard (providing feedback to a standard – "you got 80% correct") Yes No NR H. Normative standard (social comparison feedback – "you did better than 80% of your peers") Yes No NR
F1a. At what level was the feedback?	___ Self ("You are a bad writer") ___ Self-regulation ("I can tell that you did not check over you work. For every event you discuss in your paper, monitor if there is enough description.") ___ Process ("You have not used the strategies we talked about regarding how to include descriptive adjectives in a paper.") ___ Task ("You need to include more details on this topic.") ___ NR
F3a. What was the mode of the feedback?	___ Face to Face

(check all that apply)	___ Verbal (spoken words) ___ Auditory (i.e., a buzzer) ___ Written ___ Visual (i.e., an X) ___ Both auditory and visual ___ Other: _____ ___ NR
F3b. Was the feedback public or private	___ Public (another person besides the participant is aware of task performance) ___ Private (only the participant is aware of task performance) ___ Other: _____ ___ NR
F4. Was the feedback authentic? (Was the feedback based on actual task performance?)	___ No, it was irrelevant to actual task performance ___ Yes, it reflected level of task performance ___ NR *Please describe:* _____ _____
F5. Were the participants informed of whether they would receive feedback prior to receiving it?	___ Yes ___ No ___ NR
F6. What did the feedback refer to?	___ Task performance ___ Task completion ___ Engagement ___ NR
F7. What was the timeframe in between task completion and feedback (immediate vs. delayed timing of feedback)?	___ Immediately following performance ___ After 1-5 minutes ___ Between 5 – 30 minutes ___ Between 30 – 1 hour ___ More than 1 hour ___ Other: (specify_____) ___ NR
F8. How many instances of feedback? (If there were 5 trials, and feedback given after each trial, there would be 5 instances of feedback VS. 5 trials, but one instance of feedback after the series of trials)	Number: _____ (specify:_____) ___ NR

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I2. Characteristics of the Non-Negative (Control/Comparison) Feedback Variable	
What condition was the non-negative feedback variable?	___ Positive feedback ___ Neutral feedback ___ No feedback (skip rest of section) ___ NR

F1. What characteristics were used to describe the feedback? (Check all that apply.)	Did the feedback include…
	
	A. Instruction for improvement ("informational" feedback, includes hints)
	  Yes No NR
	
	B. Praise
	  Yes No NR
	
	C. Effort attributions/reasons for performance ("you did not put in enough effort into the task")
	  Yes No NR
	
	D. Ability attributions/reasons for performance ("you are not smart enough"
	  Yes No NR
	
	E. Controlling language ("should", "must")
	  Yes No NR
	
	F. Autonomy-supportive language ("could", asking questions)
	  Yes No NR
	
	G. Objective standard (providing feedback to a standard – "you got 80% correct")
	  Yes No NR
	
	H. Normative standard (social comparison feedback – "you did better than 80% of your peers")
	  Yes No NR

F1a. At what level was the feedback?	___ Self ("You are a bad writer") ___ Self-regulation ("I can tell that you did not check over you work. For every event you discuss in your paper, monitor if there is enough description.") ___ Process ("You have not used the strategies we talked about regarding how to include descriptive adjectives in a paper.")

	___ Task ("You need to include more details on this topic.") ___ NR
F3. What was the mode of the feedback? (check all that apply)	___ Face to Face ___ Verbal (spoken words) ___ Auditory (i.e., a buzzer) ___ Written ___ Visual (i.e., an X) ___ Both ___ Other: _____ ___ NR
F4. Was the feedback authentic? (Was the feedback based on actual task performance?)	___ No, it was irrelevant to actual task performance ___ Yes, it reflected level of task performance ___ NR *Please describe:* _____ _____
F5. Were the participants informed of whether they would receive feedback prior to receiving it?	___ Yes ___ No ___ NR
F6. What did the feedback refer to?	___ Task performance ___ Task completion ___ Engagement ___ NR
F7. What was the timeframe in between task completion and feedback (immediate vs. delayed timing of feedback)?	___ Immediately following performance ___ After 1-5 minutes ___ Between 5 – 30 minutes ___ Between 30 – 1 hour ___ More than 1 hour ___ Other: (specify_____) ___ NR
F8. How many instances of feedback? (If there were 5 trials, and feedback given after each trial, there would be 5 instances of feedback VS. 5 trials, but one instance of feedback after the series of trials)	Number: _____ (specify:_____) ___ NR

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I3. Characteristics of the Task	
T1. What was the task?	1 = Anagram 2 = Crossword 3 = Other word task 4 = Naming task 5 = Computer game 6 = Math task 7 = Spatial puzzle 8 = Physical activity task 9 = Reading task 10 = Athletic/sport task 11 = Other (specify_____) 99 = NR
T2. Activity was described as interesting or uninteresting?	___ Interesting ___ Uninteresting ___ Neutral ___ NR
T3. Activity was described as easy or difficult?	___ Difficult ___ Moderate ___ Easy ___ NR

Sample Level Codes	
SA1. What is this sample's ID number?	____ ____
SA2. Is this relationship for the overall sample or a subgroup?	___ Overall sample ___ Subgroup; specify: _____
SA3. Is this sample redundant with other samples reported on? (For example, you have or will code information on both the overall sample, as well as for just boys and just girls separately.)	No Yes
SA4. What country/continent did the sample originate?	___ United States ___ Canada ___ Other; specify:_____ ___ NR
SA5. Who was the receiver of the feedback?	___ General adults ___ K-12 students ___ College students ___ Athletes ___ Artists (specify:_____) ___ Employees ___ Trade ___ General unspecified sample ___ Other; specify: _____ ___ NR
SA6. If the sample consisted of students, what was the education level of the students in the sample?	___ Preschool ___ Elementary ___ Lower elementary (K-2) ___ Upper elementary (3-5/6) ___ Middle/junior high school students ___ High school students ___ College students ___ Other; specify: _____ ___ NA/NR

SA6a. If students were preschool to 12th graders, what was the grade level of the sample?	___ Pre-K ___ K ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___ NA/NR
SA7. If the sample consisted of athletes, what was the competition level of the sample?	___ Pre-collegiate ___ Collegiate ___ Professional ___ Other: _____ ___ NA/NR
SA8. If the sample consisted of employees, what was the institution type? SA8a. What type of company?	___ For profit ___ Non-profit ___ NA/NR ___ Business ___ Technology ___ Researcher ___ Manufacturing ___ Other: _____ ___ NA/NR
SA9. What was the sample's expertise level? SA9a. How was expertise level assessed?	___ Expert ___ Novice ___ Other: _____ ___ NR ___ Validated assessment ___ Researcher-created assessment ___ Self-reported expertise ___ Other-reported expertise (teacher/coach)

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SA10. What was the motivation orientation of the sample?	___ High interest ___ Low interest ___ High perceived competence ___ Low perceived competence ___ High competence valuation ___ Low competence valuation ___ Mastery goal orientation ___ Performance approach goal orientation ___ Performance avoidance goal orientation ___ Promotion/approach regulatory focus ___ Prevention/avoidant regulatory focus ___ Other; specify: _____ ___ NR
SA11. What was the socio-economic status of students in the sample?	___ Low SES ___ Low-middle SES/working class ___ Middle SES ___ Middle-upper SES ___ Upper SES ___ Only labeled as "mixed" ___ NR
SA12. What student sexes were represented in the sample?	___ Males, specify percentage:_____ ___ Females, specify percentage:_____ ___ Both ___ NR

SA13. What race/ethnicities were represented in the sample?	___ White, specify percentage:_____
	___ Black, specify percentage:_____
	___ Asian, specify percentage:_____
	___ Hispanic, specify percentage:_____
	___ Native American,
	        specify percentage:_____
	___ Other; specify type and percentage:
	      _____
	___ Not-specified mixed
	___ NR

SA14. Who was the evaluator?	___ Teacher ___ Peer ___ Coach/Trainer ___ Employer/Supervisor ___ Researcher/Experimenter ___ Computer ___ Other: _____

	___ NR
SA15. What was the evaluator's expertise level?	___ Expert ___ Novice ___ Other: _____ ___ NR
SA15a. How was expertise level assessed?	___ Validated assessment ___ Researcher-created assessment ___ Self-reported expertise ___ Other-reported expertise (teacher/coach)
SA16. What was the quality of the relationship between evaluator and feedback receiver? (Check all that apply).	___ No relationship/stranger (i.e., experimenter) ___ Close (perceived as willing to help) ___ Distant (perceived unwilling to help) ___ NR
SA17. What was the socio-economic status of the evaluator?	___ Low SES ___ Low-middle SES/working class ___ Middle SES ___ Middle-upper SES ___ Upper SES ___ Only labeled as "mixed" ___ NR
SA18. What was the sex of the evaluator?	___ Males, specify percentage:_____ ___ Females, specify percentage:_____ ___ Both ___ NR
SA19. What was the ethnicity of the evaluator?	___ White, specify percentage:_____ ___ Black, specify percentage:_____ ___ Asian, specify percentage:_____ ___ Hispanic, specify percentage:_____ ___ Native American, specify percentage:_____ ___ Other; specify type and percentage: _____ ___ Not-specified mixed ___ NR

Outcome Variable	

V1. Was the outcome variable a measure of intrinsic motivation (IM)?
 	
If yes, what type of IM measure is this?
	___ Yes
	___ No
	
	___ Free-choice behavioral measure of IM
	    a. Whether chose to work on task
	    b. Time spent working on task
	___ Self-report measure of "intrinsic motivation" (scale)
	___ Self-report of "interest"
	___ Self-report of "liking"
	___ Time to complete break task before returning to task for which IM measured.
	___ Self-report of "willingness" to engage in task again.
	___ Other (specify: _____)
	___ Could not determine

V2. If intrinsic motivation was not the sole outcome, specify "other" motivation/self-regulatory outcome	___ Task performance ___ Subsequent learning ___ Effort exerted ___ Competence valuation ___ Perception of competence ___ Perceived autonomy ___ Perceived relatedness ___ Pressure/tension ___ Self-regulatory strategies ___ "Engagement" ___ "Satisfaction" ___ Self-concept ___ Self-efficacy ___ Self-esteem/Self-worth ___ Incremental theory of intelligence ___ Entity theory of intelligence ___ Extrinsic motivation ___ Expectancies for success/Outcome expectations ___ Task Value ___ Locus attribution ___ Stability attribution ___ Controllability attribution ___ Mastery goal orientation ___ Performance goal orientation ___ Negative Affect ___ Positive Affect ___ Other

	Specify variable name:
	_____
	Describe:
	_____
V3. How was this variable measured?	___ Validated scale ___ Experimenter-created scale ___ Single-item ___ Behavioral measure ___ Written responses coded ___ Verbal interview coded ___ NR
V3a. What was the internal consistency of the measure, if reported?	$\alpha = .$ ___ ___
V4. Name of scale used to assess variable (if applicable).	Scale name: _____
V5. Domain	___ Work-related ___ General ___ Academic (many subjects) ___ Task subject; specify: _____ ___ Specific subject; specify: _____ ___ Sports ___ Art and Music; specify:_____ ___ Social ___ Other; specify: _____ ___ NR
V6. Who served as the respondent for this measure?	___ Person receiving feedback ___ Mother ___ Father ___ Parent not specified ___ Teacher ___ Observation of student/athlete/employee behavior (i.e. by researcher) ___ School records ___ Employer ___ Coach ___ Other; specify:_____ ___ NR

Effect Size Information	
E1. What was the total sample size for this relationship?	___ ___ ___ ___ ___
E2. Could the direction of the effect size be identified for this outcome measure?	No Yes
E2a. If yes, what was the direction?	-1 = Intrinsic motivation/outcome is lower for those who received negative feedback versus comparison group 0 = There is no difference between negative feedback and comparison group on variable +1 = Intrinsic motivation/outcome is higher for those who received negative feedback versus comparison group
E3. Could an effect size be derived for this outcome measure?	No Yes
E3a. If yes, what was the effect size?	*d* = ___ ___. ___ ___ *Other* = ___ ___. ___ ___; Specify type of effect size (e.g. Beta, b, pr, sr): _____ *Are there models? ___ Yes ___ No*
E3b. Record relevant information used to calculate effect size	M: _____ Group: Negative Feedback M: _____ Group: _____ SD: _____ Group: Negative Feedback SD: _____ Group: _____ N: _____ Group: Negative Feedback N: _____ Group: _____ Ind. t: _____ Comparison: _____ F: _____ Comparison: _____ *Note. F-test has to based on 2 group comparison.* Other info: _____ Frequencies Info: Chi-Square:
E3c.What is the page number that the effect size is located on?	____

E4. If an effect size could be derived, how could it be done?	___ Standard formula ___ Algebraic equivalent of standard formula (NOTE: This could be a transformation of a t-test, univariate F-test, or chi-square.) ___ Algebraic equivalent of standard formula with imprecise information (e.g., used $p < .05$ to generate an effect size) ___ Nonstandard formula ___ No effect size could be derived
E5. Is this an adjusted effect size? E5b. How many control variables are reflected in this effect size? E5a. If there are control variables, which ones are reflected in this ES?	No Yes _____ ___ Prior measure of outcome variable ___ Prior achievement ___ Sex ___ Age/Grade ___ Ethnicity ___ SES ___ Other; specify: _____ ___ NA/NR
For longitudinal studies that follow the same sample: E6. Does this effect size reflect a follow-up measure of the outcome variable? E6a. In days, when was the follow up longitudinal measure administered relative to the end of the manipulation?	 No Yes ___ ___ ___

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