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Impacts of Performance Ratings and Continuous Feedback on Employee Performance and Reactions

by

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Résumé

Au cours des dernières années, les entreprises ont expérimenté de nouvelles pratiques de gestion de performance dont : (1) l'abandon des cotes de performance et (2) l'adoption de systèmes de rétroaction en continu. Cependant, plusieurs entreprises ont mis en œuvre ces pratiques sans nécessairement évaluer rigoureusement leurs effets. L'objectif de cette étude est de mieux comprendre comment l'abandon des cotes d'évaluation de performance et l'utilisation d'une rétroaction sur la performance en continu influencent les variables suivantes : (1) la performance des individus, (2) leur motivation à s'améliorer et (3) leur niveau d'engagement envers la tâche. Une expérience de laboratoire a été menée où les chercheurs ont administré une tâche n-back à 36 participants en employant un devis factoriel mixte (2x3). Les participants ont été répartis au hasard en deux groupes : (1) les participants cotés et (2) les participants non-cotés. Chaque groupe a été reçu successivement une rétroaction de 3 sources différentes : (1) un ordinateur, (2) une personne et (3) aucune source. Nos résultats montrent que la présence de cotes d'évaluation de la performance est positivement associée à la performance. De plus, les participants ont obtenu un niveau de performance, de motivation à s'améliorer et d'engagement envers la tâche plus élevé lorsqu'ils ont reçu une rétroaction par une personne. Ces résultats apportent diverses contributions scientifiques et retombées pratiques, notamment en nuançant le discours dominant largement médiatisé par les cabinets de conseil en faveur de l'abandon des cotes d'évaluation de performance.

Mots clés : Gestion de la performance, évaluations de la performance, cotes d'évaluations, rétroaction en continu, rétroaction sur la performance, réactions des employés, motivation, engagement,

Abstract

In recent years, firms have experimented with novel performance management practices such as : (1) abandoning ratings and (2) adopting continuous feedback systems. But, firms have been implementing these practices without rigorously evaluating their effects. The objective of this study is to better understand how abandoning performance ratings and using continuous feedback influences the following variables : (1) performance, (2) motivation to improve performance and (3) task engagement . A laboratory experiment was undertaken where the researchers administered an n-back task to 36 participants using a mixed factorial design (2x3). Participants were randomly divided into two groups: (1) rated and (2) unrated group. Each group was exposed to three sources of continuous feedback: (1) computer-mediated feedback, (2) person-mediated feedback and (3) no source. Our findings show that ratings had a positive association with performance. Furthermore, participants obtained high levels of performance, motivation to improve and task engagement when they received feedback from a person. These results provide important scientific contributions and practical benefits, notably by nuancing the dominant discourse widely mediated by consulting firms in favor of abandoning performance ratings.

Keywords : Performance management, performance appraisals, performance ratings, ratings, continuous feedback, reactions to performance, employee reactions, motivation, engagement,

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Chapter 1: Introduction

Performance management can be defined as a set of management practices that help firms evaluate and direct human resources efficiently so that they can yield optimal levels of output (Armstrong, 2017; Doucet, Lapalme, Morin & Fortin Bergeron, In Press). Performance management typically includes two types of practices. First, there are practices that help implement performance management systems in a firm (e.g. performance scale development and performance-based pay). Second, there are practices that act as interventions such as, performance appraisals, performance feedback and performance ratings, which are designed to foster employee success (Mathis & Jackson, 2010).

Performance management systems generally target four main objectives (Doucet, 2019). First, they are designed to extract standardized information about employee performance. Second, they help human resource managers take better administrative decisions. Third, performance management systems use incentives to motivate employees to achieve satisfactory levels of performance. Finally, performance management systems help support the strategy of the firm by ensuring that its organizational goals and priorities are met (Doucet, Lapalme, Morin & Fortin Bergeron, In Press).

However, despite these objectives, recent findings on performance management are pessimistic about its effectiveness, leaving the field in a state of controversy (Adler et al., 2016). For instance, according to a recent survey, only 29% of firms believe that performance management helps organizations achieve their business objectives (Brecher, Eerenstein, Farley & Good, 2016). Furthermore, 89% of employees believe that current performance management practices must be changed because they are not effective. These findings are alarming because both executives and employees agree on the perceived inefficiency of performance management.

The explanations behind this dissatisfaction are complex. It seems that some performance management practices have not evolved in the way that they should have. Presently, numerous firms still adhere to traditional, maladapted practices that are not well suited for the challenges that organizations face today (Pulakos & O'Leary, 2011). As economies converge toward a single market, competitiveness increases, the nature of jobs change, and organizational agility becomes a requirement (Pulakos, Kantrowitz &

Schneider, 2019). Thus, “Employees are expected to be productive” and be adaptive to change (Alton, 2018; Harris, Russel & Harris, 2015). Nonetheless performance management is supposed to be a tool that helps organizations achieve productivity and adaptability, but this is difficult to achieve when traditional practices are applied in the current business context, as they are no longer applicable (Armstrong, 2017).

Performance ratings are a good example to illustrate this situation, asapproximately 60% of executives believe that their firms would be better off without their use and numerous firms are eliminating them from their performance management systems (Pulakos & O’Leary, 2011; Bhatnagar & Bhagyalkshmi, 2016; Deloitte, 2017a). Practitioners and scholars cite the following reasons for abandoning performance ratings. First, they are administered annually (Adler et al., 2016) and this makes them unsuited for rapid change. Second, they are mostly suited for manufacturing jobs, rather than service industry jobs which are now the most common form of employment in North America (Pulakos & O’Leary, 2011; CIA, 2020). Third, they tend to demotivate employees (Adler et al., 2016). Fourth, they are tainted with bias (Pulakos & O’Leary, 2011). Finally, they are exceptionally time consuming for managers to calculate (Brecher, Eerenstein, Farley & Good, 2016).

The Necessity for Change

Performance ratings are one of many examples of a performance management practice that is no longer functional. New approaches to performance management are necessary as there have been significant changes in the composition of the workforce, the nature of work and employee development practices. Evidently, the emergence of these changes does not mean that performance management is irrelevant, but its practices need to evolve and be more adapted to these recent manifestations.

First, the composition of the workforce in Canada has changed dramatically, millennials now represent the majority of the labor force in the country, as baby-boomers continue to take their retirement. In other words, millennials currently represent 37% of the workforce, compared to baby boomers who represent only 30% and the rest of course is Gen Z (Norris, 2015). The generational shift has pushed organizations to tailor their practices to better accommodate millennials as they have their own needs and preferences, especially in terms of performance management. For instance, they are far more interested

in receiving feedback frequently from their managers compared to their baby-boomer peers (Willyerd, 2015). Moreover, millennials are also interested in receiving meaningful feedback so that they can perform at work, but managers seldom provide them with the high-quality feedback that they need (Gallup, 2020). Impactful feedback seems to be very important to millennials, and more firms are trying to deliver quality feedback by implementing continuous feedback systems (Gallup, 2020; Deloitte, 2017a). A recent survey has demonstrated that approximately 11% of organizations have implemented such systems in their firms, which demonstrates that changes in firms are incrementally occurring on this matter (Clear review, 2017).

Second, the nature of jobs is changing. Globalization has been putting significant pressure on organizations to be highly competitive, which has led to two major changes in terms of: (1) the pace of work and (2) work organization. Managers and employees are often overwhelmed by the quantity and the rapidity with which they must complete work (Mankins, Brahm & Caimi, 2014). Thus, it is unsurprising to see that teamwork is increasingly prevalent in the workplace (Deloitte, 2017b) as it is used as a compensating mechanism to maintain high levels of competitiveness and productivity (Rousseau, Savoie & Battistelli, 2007). Firms are shifting towards a team-centric work model to improve organizational performance outcomes and the vast majority of firms have integrated teamwork in their organizations in some way (Cappelli & Tavis, 2016; Deloitte, 2017a). Firms justify the necessity of the team-centric work model because they believe it will help guarantee their success in the long-run (Deloitte, 2017a).

Third, the labor shortage in North America has had an impact on development practices, which are closely related to performance management (OECD, 2016). In the context of the labor shortage, HR practitioners often need to hire new recruits who do not necessarily have all the required skills for a job. Because of this situation, firms have been creating new training and development programs to develop the capacities of new recruits, which ensures that they obtain satisfactory levels of performance on the job (OECD, 2016). Fortunately, certain countries are proactive in helping diminish the skills gap that new recruits may face. Canada has recently injected funds in projects that would help employers invest and be more involved in employee development so that Canadian workers can develop meaningful skills (OECD, 2016). While this seems to come at a

substantial cost for the Canadian government and firms, studies show that employee motivation and retention increase when employees are presented with interesting development opportunities (Samuel & Chipunza, 2009). This is an excellent strategy that firms could use to hold onto their new millennial recruits in the long run, especially when it is considered that 87% of millennials strongly value career growth and development opportunities (Gallup, 2016a).

Promising Avenues

These changes can explain why firms are adjusting their performance management practices to the current organizational context. Notably, Adobe and Deloitte have taken the lead on this matter by implementing an important change to their performance management systems; they decided to abandon performance ratings (Bhatnagar & Bhagyalkshmi, 2016, Deloitte, 2017a). Instead, to encourage employee performance, managers provide employees with continuous performance feedback that is administered on a quarterly basis (Bhatnagar & Bhagyalkshmi, 2016, Deloitte, 2017a). This is a great change, given that performance ratings and performance feedback are typically administered together annually as part of a formal performance appraisal (Armstrong, 2017). Nevertheless, little is known about the impacts of abandoning performance ratings and replacing them with continuous performance feedback, creating an interesting avenue for future research.

Furthermore, organizations are exposed to technology more than ever before and performance appraisals are being facilitated by the use of technology (Farr, Fairchild & Cassidy, 2013). Although introducing technology in performance management practices have mainly helped firms save time and money (Farr, Fairchild & Cassidy, 2013), the current era of artificial intelligence may go quite further and bring some form of automation to the performance management process. In this context, it is surprising that we find so few empirical results in the performance management field, compared to other spheres of human resource management such as recruitment and selection (Deloitte, 2017a). An excellent example of this would be the chatbot, Olivia, who guides job candidates by asking them questions that can be later used for selection purposes (Deloitte, 2017a). The application of such technological tools in performance management could be of great importance especially if they are adapted appropriately. Even though there has

been research on providing individuals with performance feedback from different sources (Kluger & Adler, 1993; Golke, Dörfler & Artelt, 2015), there could be consequences of using automated systems to evaluate employee performance continuously rather than involving managers in the process which has yet to be explored empirically.

Research Question

Considering the preceding sections we formulate the following research question: "What are the impacts of abandoning performance ratings and adopting continuous performance feedback on employee performance and their reactions?"

Contributions

Currently, organizations spend millions of dollars and thousands of hours on performance management (Deloitte, 2017a; Brecher, Eerenstein, Farley & Good, 2016). Firms will benefit from the present study, as the effectiveness of performance ratings and continuous performance feedback (from different sources) will be assessed. In turn, this will help organizations figure out whether either practice is worthwhile for them to adopt in their firm.

Furthermore, the current study will also fill a gap in the literature with regards to the impacts of performance ratings, continuous performance feedback and its source on employee performance and their reactions. An advantage that the present study offers is the use of objective behavioral and neuropsychological methods to answer the research question. These methods will overcome the traditional limitations associated with perceptual measures which are largely used in performance management research.

The current study has been completed whilst working at the Tech3lab. The table below explains my contributions that led to the completion of the present study. All of the different steps will be described with my own contribution in percent form.

Table 1. *Contributions and personal responsibilities.*

Phase in the project	Contributions
Identifying the research problem	My supervisor Dr. Olivier Doucet and I have noticed the gap in the literature with regards to the impacts of the aforementioned performance management practices. (50%)
Literature Review	Writing the literature review. (100%)
Ethics	Writing a request to the ethics board.

	The current study is a novel project at the lab. The operations team reviewed the form before its final submission. (80%)
Experimental Design	Choosing the stimuli, developing the experimental conditions as well as the design. (90%)
Recruitment	Determining the number of participants necessary based off our design (e.g power analysis). (100%) Recruiting participants. (100%)
Pre-testing and data collection	*Pre-testing*: Ensuring that the task is operational. (100%) *Data collection*: During data collection, I was assisted by a laboratory assistant. The Tech3lab staff would install the equipment. I ensured that the task was up and running. I would administer feedback to our participants. I scheduled all of the appointments and attended all sessions. (80%)
Data Extraction	I extracted all of the data whether it be the behavioral, psychometric or encephalographic data. (100%)
Analyses	Choosing the statistical tests. (100%) Respecting the statistical assumptions of those tests. (100%) Behavioral Analyses were conducted in SPSS. (100%) Psychometric Analysis were conducted in SPSS. (100%) Electroencephalographic Analyses: Data were prepared in Brain Vision and then imported to SPSS. (50%)
Writing the article	Writing the scientific article in the thesis. (100%)

Thesis Structure

The present thesis takes the form of an article, and it is structured in the following manner. First, a literature review will be presented to the reader. Second, the thesis article will follow. Third a general conclusion will be extracted from the thesis article. Fourth, a methodological appendix will be presented to help better understand the methods and statistical analyses choices made, and present further details such as the main statistical assumptions.

Chapter 2: Literature Review

2.1. Defining Performance Management

Performance management represents a broad set of practices that are integrated to human resources management processes such as pay, rewards and employee development (Armstrong, 2017). Although the definition of performance management can vary, the most comprehensive definition of performance management originates from Aguinis (2013) who explains that performance management is the "continuous process of identifying, measuring, and developing the performance of individuals and teams as well as aligning performance with the strategic goals of the organization" (Aguinis, 2013, as cited in Scheicher et al., 2018). Essentially, performance management regroups a set of practices that allows organizations to get the performance that they need from their employees (Mathis & Jackson, 2011).

In order to do so, HR managers create performance management systems that allow them to measure performance effectively. Performance management systems are typically characterized by five key features: (1) They set performance expectations for employees and managers. (2) They allow managers to track performance and provide feedback to employees. (3) They allow managers to allocate resources to employees (e.g financial and development opportunities). (4) They reinforce the desired behaviors of the organization on employees. (5) Finally, they ensure that employees have the necessary skills to meet expectations that have been set by the organization (Armstrong, 2017).

2.2. The Origins of Performance Management

Needless to say, performance management systems as we know them today are quite different from what they were in the past. Historically, performance management has been of interest to individuals in positions of authority as they have had a strong curiosity about how they can ensure that work is being conducted effectively (Armstrong, 2017). The first performance appraisals can be traced back to the Wei dynasty (AD 221 – 265), which was a royal family that resided in China's northern provinces (Armstrong, 2017). During their rule, the emperor hired an "imperial rater" who would evaluate the performance of the official family. While the earliest origins of performance appraisals were found in China, they have also been historically documented in other areas of the world, such as in Western Europe. To be more precise, the Jesuits of the 16th century

developed a performance rating system to evaluate the performance of the members of their religious society (Armstrong, 2017). Interestingly, even centuries later, performance ratings continued to be used as a measurement tool to assess performance. For example, ratings were used to help American authorities evaluate the performance of their armed services personnel during the 1920's. A similar system was also implemented in the United Kingdom shortly after with the same goal (Armstrong, 2017).

Decades later, in the 1960's and 1980's, research on performance management begun to be of interest to the scientific community in the administrative sciences (Armstrong, 2019). Many researchers were curious to explore its different facets. For example, researchers were interested in knowing the degree of satisfaction of managers and their employees towards their performance appraisal systems (Mount, 1984). Furthermore, researchers were focused on a psychometric approach with regards to performance management. For example, there was a great interest in knowing whether different types of psychometric scales could facilitate or hinder the accuracy of performance appraisals (Cardy & Dobbins, 1994). Even today, debates are taking place about performance management, whether ratings are effective and how performance management can be improved as a whole (Adler et al., 2016).

2.3. Performance Management vs Performance Appraisal

Even with the proliferation of research in this field, more often than not, people tend to mistake performance management for performance appraisal and vice versa. Although it is a key component of performance management, performance appraisal is a distinct process and is a subset of performance management (Schleicher et al., 2018). Performance appraisal refers to "the process through which supervisors assess, after the fact, the job-related performance of their supervisees and allocate rewards to the supervisees based on this assessment" (Cappelli & Conyon, 2018). Scholars suggest that performance management and performance appraisals are similar because they involve measuring performance and they are lengthy processes (Schleicher et al., 2018), but they are different for two main reasons. First, performance management is seen as a broad set of practices, while performance appraisal is very specific as it represents a "discrete, formal and organizationally sanctioned event" (Schleicher et al., 2018). Second, performance management is a daily activity whereas performance appraisal is a singular

activity that involves assessing employee performance once or twice a year (Kinicki, Jacobson, Peterson & Prussia, 2013). That said, performance management and performance appraisals work towards the same goal.

2.2. The Goal and Purposes of Performance Management

The main objective of performance management is to ensure that "an organization remains competitive and profitable by giving managers the opportunity to "identify, communicate, measure and reward employees'" performance (Mathis & Jackson, 2011). To achieve this goal, performance management must fulfill it's: (1) administrative, (2) strategic and (3) developmental purposes.

2.2.1. Administrative Purpose

Performance management systems must help human resource managers make the most rational administrative decisions with regards to their personnel. Fortunately, the data that is collected from performance management systems are often considered to be of high utility and validity, which helps managers accomplish this objective (Aguinis, 2013). Organizations will often use employee's past performance to make personnel decisions, notably about salary, benefits, recognition programs, and also for promotions, demotions and layoffs (Noe, Hollenbeck, Gerhart & Wright, 2011).

2.2.2. Strategic Purpose

Performance management systems must help human resource managers support the strategy of their firm. This can be achieved by linking employees' behaviors to those of their team, department, and/or organization (Aguinis, 2013). Firms must clearly define their expectations and managers must ensure that these expectations are properly communicated to their employees so that they are aligned with the firm's strategy. When employees know exactly what is expected of them, they will be able to fulfill their strategic role within the firm. When employees struggle, managers will be able to measure, correct and support employee performance to ensure that the organization's targets are being met (Aguinis, 2013).

2.2.3. Developmental Purpose

Finally, performance management systems must give managers the opportunity to develop employees' talent. Through performance appraisals, managers can motivate employees to improve their performance, but managers can also help them reach new

milestones in their career (Noe, Hollenbeck, Gerhart & Wright, 2011). Managers are in a good position to explain to employees what the next steps are to advance within the organization, especially when employee performance and potential are taken into consideration (Cappelli & Keller, 2014). Developing employees can have important benefits for the firm, such as increased retention, increased motivation and a steady talent succession pipeline (Gaffney, 2005; Kuvaas & Dysvik, 2009; Shelton, 2001).

2.3. The Performance Management Revolution

In order to achieve the goal of performance management and to fulfill its purposes, firms are trying to adapt their performance management practices to the current organizational context which is influenced by a rapidly changing business environment (Armstrong, 2017; Cravens, Piercy & Baldauf, 2010; Reeves & Dimler, 2011). However, firms are changing their performance management practices so rapidly that researchers are struggling to keep up with these perfunctory changes, and they cannot determine the impacts of these novel practices on performance outcomes.

Well-known organizations such as Adobe and Deloitte have decided to review their performance management practices in recent years because of their unsatisfactory results (Bhatnagar & Bhagyalkshmi, 2016; Buckingham & Goodall, 2015). Even though these organizations are part of different industries, they both implemented two similar yet innovative changes that deserve to be mentioned: (1) the abandonment of performance ratings and (2) the use of continuous performance feedback.

2.3.1. Abandoning performance ratings

Performance ratings are a numerical value that quantitatively represent the performance of an employee (Groover, 2007). Based off this numerical rating, managers can attribute resources to their employees such as a salary increase, promotion or remove them such as demotions and layoffs (Pichler, 2012; Armstrong, 2017). Performance ratings have been an essential part of performance appraisal for decades (Armstrong, 2017), but in recent years, the conversation surrounding them has been subjected to debate (Adler et al., 2016).

Scholars and professionals have been reviewing their utility, and recent research demonstrates that even though they have been an integral part of performance appraisals,

70 % of multinational organizations are moving away from them (Cappelli & Tavis, 2016). Thus, it is important to understand the reasons behind this change.

2.3.2. Why move towards a ratingless system?

Currently, firms believe that performance ratings don't have a positive impact on employee performance and they believe that ratings have little to no added value for the firm (Adler et al., 2016; Brecher, Eerenstein, Farley & Good, 2016). Given that firms spend thousands of hours, and millions of dollars on performance appraisals; the performance ratings that are part of these assessments should yield positive outcomes (Brecher, Eerenstein, Farley & Good, 2015; Deloitte, 2017). But, performance ratings tend to create negative reactions for the majority of employees which puts their utility and effectiveness at stake (Brecher, Eerenstein, Farley & Good, 2016). Interestingly, employees are not the only ones who are discontented with performance ratings (Adler et al., 2016), managers are also unsatisfied with them as they believe that they are not effective for improving employee performance (Adler et al., 2016; Cappelli & Tavis, 2016). In this perspective, it is understandable why firms would like to change the way they assess performance because ratings are financially, temporally and emotionally taxing.

2.3.2. Ratingless Systems in Practice

In 2011, Adobe reviewed its traditional performance management system because the firm was having difficulty achieving performance goals and retaining talented employees (Bhatnagar & Bhagyalkshmi, 2016). Adobe's traditional system was characterized by formalized yet infrequent performance management interventions. The formality behind appraisals burdened managers as much as they did employees. The process was exceptionally time consuming for managers and they often had to take difficult administrative decisions as they had to force-rank employees who were all exceptionally talented (Bhatnagar & Bhagyalkshmi, 2016; Garr & Liakopoulos, 2014). Employees reported that the traditional approach left them, uninspired, demotivated, and did not believe that their performance was being assessed accurately. A combination of these factors is what ultimately drove the firm's highly skilled employees to accept jobs at the firm's competitors (Bhatnagar & Bhagyalkshmi, 2016). Naturally, these consequences represented a major problem for Adobe because they were not only losing

time and money, but they were also losing valuable employees. Consequently, Adobe decided to change the way it managed performance.

The firm took the following initiatives to remedy the situation: (1) Adobe decided to abandon performance ratings and (2), it decided to implement frequent yet informal performance appraisals that were labelled as "check-ins" to support employee performance (Bhatnagar & Bhagyalkshmi, 2016). In other words, appraisals were conducted every other month, and this allowed managers to explain their expectations to their subordinates, support their growth and development as well as communicate organizational goals (Bhatnagar & Bhagyalkshmi, 2016). The new approach yielded positive results. Adobe claims that it has saved approximately 80 000 hours of managers time and it has increased talent retention significantly (Bhatnagar & Bhagyalkshmi, 2016). However, these are not the only benefits, the employees were more engaged at work (Bhatnagar & Bhagyalkshmi, 2016).

Deloitte also adopted a ratingless system as their traditional performance management system was failing to yield positive results (Buckingham & Goodall, 2015). Similar to Adobe, Deloitte's performance management system was also characterized by formal yet infrequent performance management interventions (Deloitte, 2017a). Managers at the firm would spend up to 2 million hours a year only on administering performance ratings. Managers at the firm reported that the time that they have invested on performance ratings failed to drive employee engagement and performance (Buckingham & Goodall, 2015). To respond to these shortcomings, they decided to: (1) conduct frequent informal check-in's, (2) abandon performance ratings, and (3) give performance snapshots to employees (Deloitte, 2017a). While the first two solutions were also adopted at Adobe, what makes Deloitte unique is its performance snapshots. These refer to a set of four questions that managers answer to assess employee performance where managers could either agree/disagree with the following statements (Buckingham & Goodall, 2015):

(1) "*Given what I know of this person's performance, and if it were my money, I would award this person the highest possible compensation increase and bonus*."
(2) "*Given what I know of this person's performance, I would always want him or her on my team*.
(3) "*This person is at risk for low performance*."

(4) "*This person is ready for a promotion today*."

Employees would be able to examine the results of these questions with every check-in that would be conducted by their managers. These simple performance snapshots essentially replaced the complex appraisals that would yield a single performance rating. Deloitte claims that their ratingless system has empowered and engaged employees as managers are now able to have more meaningful conversations with their employees and focus on their development (Buckingham & Goodall 2015; Deloitte, 2017a).

2.3.3. Are performance ratings worth it?

The two business cases demonstrated how and why some firms have abandoned performance ratings. While these business cases do depict abandoning performance ratings as being beneficial, there are no valid empirical conclusions that can be made based off such anecdotal evidence. Thus, it is important to examine the normative literature to extract the advantages and disadvantages of this practice.

2.3.3.1. Advantages

According to the literature, performance ratings are beneficial for three main reasons.

First, as previously mentioned performance ratings are used by human resource managers to make administrative decisions (Adler et al., 2016). Performance ratings help managers decide who will receive a promotion or a demotion. Employees understand that ratings are used to document their performance and that good performance can help them increase their chances of receiving a reward, as well as furthering their career opportunities and vice-versa. The same cannot be said in a ratingless system where there are no existent performance criteria and employees cannot always be compared in a standardized manner.

Second, because performance ratings are closely tied to rewards, abandoning them can spark conflicts in terms of fairness (Goler, Gale & Grant, 2016). For example, when managers cannot justify why they are promoting one individual versus another, this can definitely violate employee perceptions of procedural and distributive justice. Employees are not only curious about how they fair against their peers, but employees want to know how they are being assessed and who is conducting the appraisal (Goler,

Gale & Grant, 2016). Thus, it may not be the best idea to discard performance ratings without studying the impact of their absence.

Third, performance ratings help managers identify the strengths and weaknesses of their employees (Adler et al., 2016; Goler, Gale & Grant, 2016). This is relevant because managers can help employees acquire skills that they are lacking so that they can be better at their job. By having conversations related to performance, managers and employees can prioritize which skills are the most important to develop (Goler, Gale & Grant, 2016). This would not only result in better performance, but it could also improve employee's opportunities for a promotion. In any case, it is difficult to detect strengths and weaknesses of employees in a ratingless system as there isn't a way to identify strengths and weaknesses. It is also difficult to weigh the importance of different skills related to an employee's job.

2.3.3.2. Disadvantages

Despite these benefits, there are four reasons why performance ratings can be deleterious.

First, cognitive and psychometric variables can bias the objectivity of performance ratings. Even though raters have the best intention of giving the most objective rating, they cannot completely escape many biases that can impact them unconsciously such as: (1) the halo effect, (2) the horn effect, (3) leniency error, (4) strictness error, (5) recency effect, (6) contrast error and (7) similarity bias (Shanmugam & Garg, 2015). To dampen the effects of rater bias, researchers have developed rating scales to guide raters in their performance appraisals (Cardy & Dobbins, 1994). The most common scales that are used in firms are : (1) graphic rating scales (GRS), (2) behaviorally anchored rating scales (BARS) and behaviorally observed scales (BOS) (Adler et al., 2016; Cardy & Dobbins, 1994; Tziner, Joanis & Murphy, 2000). While some of these scales may seem to be superior to another (Tziner, Joanis & Murphy, 2000), it is important to keep in mind that managers are often ill equipped to use these tools for appraisal, because even when managers are trained to use these scales efficiently and objectively, their ratings seldom improve in terms of accuracy (Adler et al., 2016).

Second, performance ratings are also impacted by environmental factors (Adler et al., 2016). Some studies have shown that the economy, labor market, organizational

climate, culture and politics can affect the objectivity of performance ratings (Grey & Kipnis, 1976; Murphy & Cleveland, 1991, 1995, cited in Adler et al., 2016; Tziner & Murphy, 1999). For example, managers may use organizational politics to manipulate performance ratings and demote certain employees that can become an obstacle if they were to be promoted. Managers may have the incentive to manipulate ratings especially when it is to their advantage in terms of status and/or financial gain (Tziner & Murphy, 1999). Thus, it is not uncommon for managers to give their subordinates lenient or strict ratings to benefit themselves in some way (Tziner & Murphy, 1999). In sum, it seems that raters cannot be fully objective when conducting performance appraisals because of the presence of proximal and distal variables that influence their decisions.

Third, even when organizations try to use multiple raters to assess the same performance of an employee, raters often disagree about the ratings that they would administer, and this is a consistent finding in the normative literature. Disagreement amongst raters tends to differ between raters of equal or different status (Adler et al., 2016). In other words, whether you are being assessed by two managers or a manager and one of your peers, everyone's rating is likely to be different. Thus, it is difficult to provide performance ratings that are reliable, and if a measure is not reliable, it cannot be valid (Urbina, 2004).

Fourth, because measurement error is constantly present, ratings can create frustration for ratees. This is evident because employees often feel that the performance ratings that they receive are seldom commensurate with their efforts (Bhatnagar & Bhagyalkshmi, 2016; Adler et al., 2016). Furthermore, ratings are not only frustrating, but they can be stressful. It is not uncommon for employees to react negatively after receiving disappointing performance ratings (Carter & Delahaye, 2005). Up to 58% of employees report being stressed and approximately 25% of employees are so emotionally upset that they cry after receiving a disappointing performance rating (Adobe, 2017). Evidently, these strong negative reactions are not the desired outcome, but they seem to be inevitable.

To summarize, performance ratings can bring clarity, fairness and development opportunities to the table, but they are not completely objective. This lack of objectivity generates issues for managers as much as it does for employees who tend to react negatively to performance ratings.

2.4. Performance feedback in Performance Appraisals

2.4.1. Performance Feedback

The abandonment of performance ratings is not the only trending practice in firms. The use of rich and continuous performance feedback has become the alternative to support employee performance in lieu of ratings (Deloitte, 2017a). Unfortunately, for some managers, feedback is perceived as unimportant and unnecessary (Brutus & Gosselin, 2007). But, employees do require feedback for guidance and encouragement to meet performance targets (Brutus & Gosselin, 2007).

There are many definitions of performance feedback in the normative literature, but it can be defined as any information that is received by an employee about their past performance or understanding (Hattie & Timeperly, 2007; Wisniewski, Zierer & Hattie, 2020). Performance feedback can be administered in a "solicited or spontaneous, written or spoken, positive or negative, infrequent or frequent and formal or informal" manner (Brutus & Gosselin, 2007). It can also be delivered by managers, peers, subordinates, and/or technology (Brutus & Gosselin, 2007).

Nonetheless, providing employees with performance feedback is a complex, dynamic and emotional process and it is often experienced as an affective event (Alam & Singh, 2019). Providing employees with feedback is complex because managers must measure multiple dimensions of performance and distinguish which aspect of performance needs to be improved (Wisniewski, Zierer & Hattie, 2020). It is a dynamic process because managers must interact with their employees and conduct interventions to help them ameliorate performance. Finally, the process can also be emotional for employees because managers are exposing them to sensitive information about their performance (Alam & Singh, 2019).

2.4.2 Impacts of feedback: A double edged sword

Providing employees with performance feedback can have positive and negative outcomes. A meta-analysis on performance feedback reported that performance feedback results in a positive outcome only one third of the time and it either has no impact or a negative outcome the rest of the time (Kluger & DeNisi, 1996, as cited in Alam & Singh, 2019). However, when this practice is implemented correctly, employees can benefit greatly from feedback because they can learn from their mistakes and they can boost their

performance (Pichler, Beenen & Wood, 2018). The contrasting effects of feedback pushes for the exploration of its positive and negative impacts on employee performance.

2.4.2.1. Negative impacts of feedback

Performance feedback can have negative impacts on employee performance, when it is not implemented correctly (Kluger & DeNisi, 1996). It is also deleterious when managers do not make use of the well-established tools and recommendations that have been developed by experts to maximize the benefits of feedback interventions (Baker, Perreault, Reid & Blanchard, 2013). When managers do not deliver high-quality feedback efficiently, employees are more likely to be disengaged (89%) and look for other jobs (79.6%) (Brower & Dvorak, 2019). Furthermore, when feedback is not delivered properly, employee self-esteem can be threatened and employees can become defensive towards their manager (Alam & Singh, 2019). This defensiveness becomes counter-productive in the long-run because it leads employees astray from accepting pertinent advice and learning new skills that could help them move forward with their career. Low quality performance feedback can also impair supervisor-employee relationships and make work unnecessarily frustrating (Alam & Singh, 2019).

2.4.2.1. Positive impacts of feedback

But, even though research shows numerous negative consequences to delivering performance feedback, as previously mentioned, negative outcomes occur mostly when it is administered without care. Performance feedback is beneficial, and it can help bring the best out of people, it enables employees to reach their highest levels of performance and potential (Gasperini, 2013; Cummings, Schwab & Rosen, 1971). Performance feedback enables employees to reach these highs when managers set goals and develop strategies for them (Gruman & Saks, 2011; Ward, 2011). Performance feedback can help managers change employee behaviors that dampen performance and transform them into more productive behaviors that help them exceed expectations (Carpentier & Mageau, 2013; Pichler, Beenen & Wood, 2018). Feedback can be an effective tool because it can help people learn new skills, tasks, and overcome their weaknesses (Wisniewski, Zierer & Hattie, 2020; Pichler, Beenen & Wood, 2018). When managers use the high-quality practices, employees are 3.9 times more likely to be engaged and only 3.6% of employees who receive high quality feedback look for another job (Brower & Dvorak, 2019).

To summarize the negative and positive consequences of performance feedback, it can be an effective tool to increase employee performance. However, if it is not built on strategic principles it can yield negative outcomes. Firms should strive to maximize the quality of the feedback they administer in order for them to reap its benefits.

2.4.3. How to convey efficient feedback?

So far, the current review has defined feedback and illustrated its pros and cons. However, it is also important to shed some light on feedback models that can help us understand how managers can convey high-quality/efficient feedback to their employees. Multiple models exist in the normative literature that highlight different practices and characteristics of feedback that can help managers achieve this. The "models" of (1) Brutus and Gosselin (2007), (2) Aguinis, Gottfredson and Joo, (2012) and (3) Carpentier and Mageau (2013) will be explored. According to the authors, managers can greatly benefit from following their recommendations as their models are built with the premise of facilitating feedback acceptance. Thus, when employees are more likely to accept feedback, managers can maximize its positive outcomes and limit its potential pervasive effects. Thus, in the context of the present literature review, high-quality or efficient feedback is defined as feedback that is likely to be accepted by employees and that is likely to result in desired levels of employee performance.

2.4.3.1. Brutus and Gosselin's Integrative Feedback Model

Brutus and Gosselin (2007) developed an integrative model of feedback, they identified high-quality feedback characteristics which can help managers deliver the "best" feedback they can. The authors explain that high-quality feedback will depend on multiple factors such as: (1) the level of formality of the feedback, (2) its contents, (3) polarity and (4) frequency.

First, they suggest that managers should provide employees with both formal and informal feedback. Formal feedback can be defined as information that is given about an employee's performance during a scheduled performance appraisal (London & Smither 2002), whereas informal feedback can be defined as information about an employee's performance that is administered in day to day interactions (Brutus & Gosselin, 2007; London & Smither, 2002). In any case, both formal feedback and informal feedback can be useful to boosting employee performance. On the one hand, formal feedback helps

managers assess gaps in performance while on the other hand, informal feedback helps managers check-in with employees on a regular basis to ensure that employees are meeting objectives (Brutus & Gosselin, 2007). The authors of the model explain that both types of feedback must be administered to an employee throughout time because informal feedback is not as comprehensive as formal feedback. Thus, the efficiency of feedback is maximized when both practices are combined (Brutus & Gosselin, 2007).

Second, in terms of feedback content, managers should create feedback that is descriptive and experiential, but not inferential (Brutus & Gosselin, 2007). In other words, managers should include information about performance that is observable and that can be verified (descriptive information). Managers should address the feelings of their employees with regards to their performance (experiential information). However, managers should avoid making statements that are based on the employee's personal characteristics (inferential information) (Brutus & Gosselin, 2007). In this perspective, feedback is most efficient when managers stick to the facts (Brutus & Gosselin, 2007). When managers use biased inferential information, employees are more likely to reject the feedback that they receive and be defensive which ultimately results in counterproductive outcomes (Alam & Singh, 2019; Brutus & Gosselin, 2007; Kluger & DeNisi, 1996).

Third, the feedback that employees receive can also be defined by its polarity, meaning that it can be positive or negative (Brutus & Gosselin, 2007). Positive feedback is usually given to support great employee performance. For example, providing employees with encouragement and highlighting the skills that they used to do an outstanding job at work is considered to be positive feedback. Negative feedback is different in nature, as it is administered to correct employee behaviors that are not leading to desired levels of performance. For example, a manager may explain to an employee why they are not achieving goals and what strategies they could use to improve their shortcomings. Even though employees are more likely to be defensive to negative feedback, this doesn't mean that it cannot be conveyed in an efficient way. For example, if managers present negative feedback as a learning opportunity it can be accepted more easily. Furthermore, if managers demonstrate that they are supportive of an employee it can provide the worker with reassurance. Also, providing employees with solutions

instead of simple comments about their performance can be helpful and this kind of information can ameliorate their learning experience (Brutus & Gosselin, 2007).

Finally, the frequency with which feedback is administered can have an impact on the efficiency of feedback. If feedback becomes too frequent, it loses its pertinence. For example, telling your employees they are doing an outstanding job every day may seem like a great practice. But, they may begin to resent this type of feedback as it becomes generic. However, feedback should not be administered rarely either because employees will not be able to receive guidance when they need it. There needs to be a balance in terms of frequency so that managers can correct employee performance without being overbearing or absent. (Brutus et Gosselin, 2007).

2.4.3.2 Aguinis, Gottfredson and Joo's Strengths-Based Management Model

Moving onto the Aguinis, Gottfredson and Joo (2012) model, these authors have identified nine practices/recommendations that they believe are necessary for managers to convey efficient feedback. Their model bases itself on positive psychology and it aims to assist managers in conveying negative performance feedback in the most productive way (Aguinis, Gottfredson & Joo, 2012; Brutus & Gosselin, 2007). Thus, when Aguinis and his colleagues refer to performance feedback, it usually occurs in a context where a manager is trying to correct low performance.

First, they explain that in order to convey performance feedback efficiently, managers must adopt a strengths-based management approach to performance management. The strengths-based management approach focuses on "identifying strengths, providing positive feedback on how employees are using their strengths to exhibit desirable behaviors and achieve beneficial results, and asking them to maintain or improve their behaviors or results by making continued or more intensive use of their strengths" (Aguinis, Gottfredson and Joo, 2012).

Second, should a manager identify an employee's weakness(es), managers should avoid focusing on what tasks they have done incorrectly, but instead, managers should remind the employee of what they could have accomplished (Aguinis, Gottfredson and Joo, 2012).

Third, instead of focusing on weaknesses, managers should highlight the knowledge and skills of an employee and link them to their performance. Focusing on

knowledge and skills is crucial because employees can obtain new knowledge and skills easily, whereas talents are much harder to develop (Aguinis, Gottfredson and Joo, 2012).

Fourth, for feedback to be efficient, the manager administering the feedback must be credible. Managers must know the employee well, and they must understand the skills that are necessary to meet the requirements of the job. Also, feedback interventions from credible individuals are more likely to be successful especially when they are empathetic and relatable (Aguinis, Gottfredson & Joo, 2012).

Fifth, feedback must be conveyed in a private setting. Given that information about performance is sensitive, confidentiality must be ensured for all employees. Breaches in confidentiality could spark negative employee reactions (Aguinis, Gottfredson & Joo, 2012).

Sixth, feedback must be administered in a considerate manner. Thus, managers must let employees express themselves about their performance during appraisal. Should the manager need to relay negative feedback during appraisal, he must frame the negative feedback in a positive way (e.g for each negative comment, three positive comments must follow) (Aguinis, Gottfredson & Joo, 2012).

Seventh, feedback must be administered with great accuracy and detail. Employees want to know which actions lead to good performance and which ones did not. Therefore, managers must base their assessments on measurable and observable behaviors (Aguinis, Gottfredson & Joo, 2012).

Eighth, managers must explain to employees that their individual improvements in performance not only benefit themselves, but they benefit their team(s) and the firm (Aguinis, Gottfredson & Joo, 2012).

Finally, managers should follow up with employees, managers can provide employees with a development plan to evaluate and monitor their progress periodically (Aguinis, Gottfredson & Joo, 2012).

2.4.3.3.Carpentier and Mageau's Model

The last model presented is the model of Carpentier and Mageau (2013). They have cited eight recommendations that are likely to improve feedback quality in the context of conveying negative performance feedback, however, these based themselves on self-determination theory to formulate these recommendations.

The first recommendation is that managers must demonstrate empathy towards their employees and their performance.

Second, when employees have low performance, managers should intervene with suggestions and/or solutions that the employee can choose from. Employees are then expected to pick the most adapted solution for them and to work on their weaknesses.

Third, the feedback that managers provide to employees must be based on clear and attainable objectives with tips on how to improve their performance. Feedback should always be realistic and attainable, and it should not discourage employees from improving their performance.

Fourth, Carpentier and Mageau (2013) explain that managers should avoid person-related statements that may fuel blame. Engaging in such dialogue can definitely damage the relationship between the employee and their manager. Thus, it is best to remain descriptive, factual and empathetic.

Fifth, feedback should be paired "with tips on how to improve future performance" (Carpentier & Mageau, 2013). Providing employees with different solutions is not enough. It must specifically relate to their performance.

Sixth, feedback should be delivered promptly. Managers should not have to wait until a formal performance appraisal in order to update their employees (Carpentier & Mageau, 2013). Certainly, formal performance appraisals are useful, but occasional check-ins to correct employee performance goes a long way for both the employee and the firm.

Seventh, feedback must be delivered in a private setting. As it has been previously mentioned, it can be upsetting for certain employees to receive feedback in public (Aguinis, Gottfredson & Joo, 2012; Carpentier & Mageau, 2013).

Finally, all of these steps must be done respectfully by using "a considerate tone of voice" (Carpentier & Mageau, 2013). By following all of these recommendations, managers can foster a greater sense of autonomy, competence and relatedness in their employees.

2.4.3.4.What is good feedback ? A Comprehensive Comparison

The models of Brutus and Gosselin (2007), Aguinis, Gottfredson and Joo (2012) and Carpentier and Mageau (2013), have been thoroughly described. The table presented on the next page synthesizes their recommendations.

Table 1: *A comparative table of high-quality feedback models*

	Brutus and Gosselin (2007)	Aguinis, Gottfredon and Joo (2012)	Carpentier and Mageau (2013)
1.Theoretical approach	- Not specified	- Strengths-based management	- Self-determination theory
2. Feedback Characteristics	- Formal and informal - Continuous Feedback - Descriptive and experiential feedback to help employees change behavior - Feedback based on observable behaviors	- Feedback needs to be specific, accurate and described in great detail. - Follow ups are necessary - Focus on knowledge and skills that can be changed	- Feedback must be administered as needed. - Feedback based on observable behaviors and oriented towards attainable objectives - Paired with tips and solutions
3. Other characteristics	- Feedback must be given by a credible source. - Professional tone	- Feedback must be given by a credible source - Privacy is necessary	- Privacy is necessary - Empathy is necessary - Tone should be respectful

2.4.3.4.1. *Models summary*

Brutus and Gosselin's (2007) model provides general guidelines for providing great feedback whether it is positive or negative. However, Aguinis, Gottfredson and Joo, (2012) and Carpentier and Mageau (2013) have intentionally created models for managers to improve the quality of negative performance feedback as it is more difficult to convey.

But even though these models are based off of different approaches, they do have points of convergence. Overall, it seems that employees can benefit from formal and informal feedback to improve their performance. Feedback needs to describe observable behaviors that are evidence based. By observing employee performance, managers can collect information and pinpoint behaviors that need to be changed. Managers can focus on skills and knowledge which are things that employees can acquire. Managers or figures of authority who are credible should be giving feedback to the employees in a private setting. Managers need to demonstrate empathy while maintaining a professional and respectful tone. According to the authors, these would be the main characteristics of feedback that are necessary for it to be effective.

2.4.4 Individual characteristics

Although managers can configurate performance feedback to be of great quality, research has shown that differences in individual characteristics can determine how people accept performance feedback.

According to Brutus & Gosselin (2007), there are two main constructs determine feedback acceptance: (1) feedback orientation and (2) self-efficacy. First, feedback orientation refers to the inclination that an employee has towards receiving and accepting feedback (Linderbaum & Levy, 2010). Employees who are oriented towards feedback are more likely to accept it, make use of it and vice versa (Brutus & Gosselin, 2007).

Second, self-efficacy refers to the belief that an individual has about their capacity to meet an objective (Bandura, 1982). People who are high on self-efficacy tend to accept negative feedback more easily and thus they are more likely to apply themselves so that they can meet objectives (Brutus & Gosselin, 2007).

Feedback orientation and self-efficacy are difficult to change because they are inherent to each individual, thus, it is important for managers to keep these constructs in mind in case if they feel like they are lacking tact. Not all employees will be receptive to

feedback. But it is important for managers to keep in mind it is a practice of high-utility and the effectiveness of feedback is maximized when they follow the best practices. In sum, Managers should not feel discouraged to intervene even though some employees may be more resistant than others.

2.4.5. Electronic feedback

In the current literature review, feedback was defined, and the characteristics of high-quality feedback were identified. Up until now, the reader assumed that feedback was conducted face-to-face, as it usually is administered in most contexts. However, recent literature demonstrates that face-to-face contact is not as necessary as it used to be because new technological advances enable managers to administer performance feedback electronically.

Firms have attempted to automate different aspects of performance appraisal in the last few years and have reduced its temporal demands on managers (Smither & London, 2009; Levy, Tseng, Rosen & Lueke, 2017). For example, recent software developments allow firms to measure and appraise performance electronically without managers getting excessively involved in this process (Smither & London, 2009; Tomczak, Lanzo & Aguinis, 2018). Typically, firms use two types of systems to measure performance and provide feedback: (1) electronic performance monitoring and (2) electronic performance appraisal. While these two systems may seem similar, they are distinct. Electronic performance monitoring refers to the use of technology "to observe, record and analyze information that directly or indirectly relates to employee job performance" (Bhave, 2014; Stanton, 2000, cited in Ravid, Tomczak, White & Behrend, 2020). This type of software is mostly involved in the objective measurement of employee performance (Tomczak, Lanzo & Aguinis, 2018). Whereas electronic performance appraisal refers to an electronic system that is "used to manage performance and provide feedback" (Levy, Tseng, Rosen & Lueke, 2017). Therefore, electronic performance appraisals are mostly used to conduct interventions.

Firms can provide feedback on a more regular basis through the use of electronic performance appraisals (Levy, Tseng, Rosen & Lueke, 2017). For example, electronic performance appraisals can be conducted through the use of an elaborate online system where managers fill out performance assessment questionnaires (Miller, 2003; Summers,

2001). Employees can then consult their performance appraisal report online once it is complete (Miller, 2003). Managers can then follow up with employees on demand or based off regular intervals since reminders can be set easily in electronic performance appraisal systems (Ewenstein, Hancock & Komm, 2016; Thite, 2018). Firms such as General Electric have used technology to facilitate the administration of feedback. Their business case with electronic performance appraisals will be depicted below.

2.4.5.1.General Electric's PD@GE

Similar to Adobe and Deloitte, General Electric wished to abandon its traditional annual performance appraisals with forced rankings for a system that would foster innovation and that would focus on employee development (Proctor & Galicia-Alamanza, 2017; Zeng, 2016). In order to fulfill this goal, General Electric had dropped annual appraisals as well as forced rankings. But most importantly, they developed a mobile application titled as "Performance Development at General Electric" (PD@GE) to support employee performance. This application helps achieve this goal in four different ways.

First, the application helps employees keep track of their performance goals in the short term so that they can receive feedback from their managers (Zeng, 2016). Second, the feedback that managers administer to employees can be done electronically by sending employees notes / voice messages (Zeng, 2016). Third, employees can request feedback from their managers when they think that they require additional support (Ewenstein, Hancock & Komm, 2016). Finally, the application keeps track of employee performance with quantitative and qualitative indicators, and this helps employees adjust their performance as needed (Ewenstein, Hancock & Komm, 2016). GE's new system is especially beneficial because the use of technology facilitates the communication of goals to employees which allows for organizational performance and agility (Ewenstein, Hancock & Komm, 2016; Narasimhan, Jordan & Huang, 2019; Nisen, 2015).

Although the application is impressive, it is important to consider that GE did not fully automate its performance management system. Thus, even though managers can send feedback electronically through thee PD@GE application, feedback is not administered by a computer. Instead, feedback is administered by a human with the computer or mobile phone as the medium. It is also important to emphasize that this

system was also designed to favor meaningful interactions between managers and employees so that they can receive pertinent feedback in person (Ewenstein, Hancock & Komm, 2016).

2.4.5.2.Computer mediated feedback

Some studies have examined the impacts of fully automated performance appraisal systems. One of the first studies that examined the differences between computer and person mediated feedback was Kluger and Adler (1993). They wanted to know whether computer mediated performance feedback could have a positive impact on employee performance, feedback seeking behaviors, and motivation. Their results demonstrated no statistically significant differences in terms of performance and motivation, but they did find evidence to support that participants sought feedback from the computer instead of the experimenter (Kluger & Adler, 1993). This is a curious finding because computers cannot interact with individuals in the same way as there is an absence of an affective dimension to feedback which can be important for some employees.

To summarize, the use of technology in the context of performance management is relatively novel. Firms are trying to use technology to facilitate performance appraisals so that they can measure performance accurately and convey feedback in a timely manner. But, very few studies have examined the impacts of using these tools.

2.5. Employee Reactions and Performance Management

For performance management to be effective, employees need to hold positive perceptions of performance management practices (Murphy, Cleveland & Hanscom, 2018). More specifically, research shows that employee reactions influence the acceptance of performance management practices such as ratings by employees, (Iqbal, Akbar & Budhwar, 2015; Roberts, 2003). Employee reactions can be defined as the: "individual-level attitudinal evaluations and responses to the performance appraisal process" (Pichler, 2012). The definition by Pichler (2012) assumes that employee reactions stem from individual attitudes, *i.e.* mental and psychological events that are built from previous experience (van Giesen, Fischer, Dijk & Van Trijp, 2015). Based off these experience-dependent attitudes, individuals evaluate events that occur in their environment and react to them (Fazio & Roskos-Ewoldsen, 2005). When this concept is applied to performance management, it becomes easier to imagine how performance

appraisals can spark different types of reactions. If an employee has had negative experiences with performance appraisals, they are more likely to hold negative attitudes and react negatively towards them.

Employee reactions to performance appraisals include: (1) perceptions of fairness, (2) perceived accuracy, (3) perceived utility, (4) appraisal satisfaction, and (5) motivation to improve performance. Even though there is not complete consensus amongst researchers about what employee reactions include, these concepts are the most cited in the literature and these concepts are most often related to performance appraisal and they will be further discussed below (Keeping and Levy, 2000; Pichler, 2019; Pichler, 2012).

First, perceptions of fairness refer to the "measure of an individual's perception that their appraisal review was fair overall" (Pichler, 2019). Employees use the concept of fairness to interpret the outcomes of administrative decisions, such as appraisal, pay, promotions and demotions (Noe, Hollenbeck, Gerhart & Wright, 2011). Perceptions of fairness are thus crucial to sustain as they significantly impact employee attitudes. For example, "job satisfaction, turnover intentions, organizational commitment and workplace behavior, such as absenteeism and organizational citizenship behavior" can all be impacted by how "fair" employees "feel" like they are being treated (Colquitt et al., 2001).

Second, perceptions of appraisal accuracy refer to "an individual's perception that their appraisal accurately reflects their performance (Pichler, 2019). If an employee feels like their performance was not evaluated properly and they suffer a negative consequence because of an inaccurate appraisal, such as a demotion; they will begin to believe that the appraisal system is flawed. In this perspective, it is important to control rater biases and ensure that managers need are as objective as possible when they conduct performance appraisals (Roberts, 2003).

Third, appraisal utility is a measure of the extent to which individuals feel the feedback they receive is useful (Pichler, 2019). Providing employees with high-quality feedback is important for them to feel like the appraisal that they had was useful. In other words, that the feedback that has been provided to them can help them improve their performance. Unfortunately, many employees still believe that performance appraisals are not as useful as they could be, but this could partially be explained by the poor training

that managers receive to appraise performance (Bradley & Ashkanasy, 2001; Brutus & Gosselin, 2007).

Fourth, appraisal satisfaction, which translates into how satisfied an individual is with the appraisal review, is the most studied employee reaction (Keeping and Levy, 2000). When employees are evaluated, they can be dissatisfied with their appraisal for a number of reasons (e.g. inaccurate appraisal, useless feedback, organizational politics). However, ensuring that employees are satisfied with the appraisal process can be beneficial for employee productivity, retention, customer satisfaction and firm profitability (Palaiologos, Papazekos & Panayotopoulou, 2010).

Finally, motivation to improve performance refers to the "measure of an individual's intention to improve their performance subsequent to the review" (Pichler, 2019). In other words, it is the probability to which the employee will be motivated to use the information that they received during their appraisal and adjust their performance. Unlike appraisal satisfaction, motivation to improve performance has been less popular in the literature. It is nonetheless a relevant construct to examine because it helps researchers and practitioners find solutions to make the best of employee productivity (DeNisi & Pritchard, 2006).

To summarize, employee reactions are important to consider in performance management because they dictate whether employees will internalize any of the information that is given during appraisal.

2.5.2. Physiological reactions to performance management

Research on employee reactions is quite novel, the most significant works have emerged in the early 2000's (Pichler, 2019) and is mostly correlational in nature. Researchers have tried to gain a better understanding of the associations between performance appraisals and the reactions that they can spark from employees. However, experimental research can tell an interesting story about this topic from a neuroscientific perspective. To that end, two studies have been identified in the current review that are believed to have had an important contribution to the field of human resources and neuroscience.

2.5.2.1. Rock, Davis and Jones (2014) study

The first study is that of Rock, Davis and Jones (2014). These researchers examined the impact of performance ratings on employees' cognitive, affective and neuropsychological responses. The authors explained that performance ratings can trigger fight-or-flight response which typically arises in situations of threat (i.e. neuropsychological response). Through their work, the researchers developed the SCARF theory to better understand this phenomenon. The SCARF theory posits that there are 5 variables that explain why employees can react physiologically to performance evaluations: (1) Status, (2) Certainty, (3) Autonomy, (4) Relatedness and (5) Fairness.

First, Rock, Davis and Jones (2014) explain that employees are threatened by performance ratings because performance ratings put an employee's status in danger. Receiving a performance rating and being ranked stigmatizes low performers and this can have consequences on their employment.

Second, they mention that employees cannot help themselves from reacting negatively to performance ratings because employees lack certainty about how their performance is evaluated. This asymmetry of information can lead to two problems, namely the lack of transparency and communication. If employees do not know how they are being evaluated, it is difficult for them to understand how they should improve. This can be upsetting and distressing for many employees who are trying to do their best with the little guidance they have (Rock, Davis & Jones, 2014).

Third, performance ratings do not foster a sense of autonomy in employees. Employees may react negatively to performance ratings because they perceive that they are constantly being monitored. This type of evaluation system subtly implies that employees lack autonomy. This lack of confidence on behalf of management may hamper their relationship with their employees as they can feel like they are accused of constantly underperforming (Rock, Davis & Jones, 2014).

Fourth, performance ratings seem to dismantle relatedness, or the capacity to collaborate with others. When performance ratings are related to other forms of compensation such as bonuses, employees may become more competitive, hence impairing the quality of the work environment. According to Rock, Davis & Jones (2014),

performance ratings lead employees astray; they spend more time competing amongst themselves instead of pooling their strengths to help their firm compete on the market.

Finally, the authors express that employees react strongly because performance ratings lack fairness. The decisions that result from performance appraisals are often seen as arbitrary and are not always taken with the employee's best interests, especially when they must be done according to a bell-curve. Many highly motivated and performing employees have often been demoted or fired because of performance ratings and forced rankings with no valid justification (Rock, Davis and Jones, 2014).

2.5.2.2. Venables and Fairclough (2009) study

The second study is that of Venables and Fairclough (2009). These researchers developed an experiment that examined the physiological reactions of individuals following the presentation positive and negative performance feedback on a cognitive task. They used electroencephalography to measure participants' physiological reactions to the positive and negative feedback that employees would receive. They had programmed the experiment in a way that would consistently give positive feedback to one group and negative feedback to the other group regardless of their performance. In this experiment there were no statistically significant differences in terms of performance. Although these results can indicate that the individuals in the positive feedback group got the encouragement they needed to perform better, the situation is less clear for the participants in the negative feedback group. One way of interpreting the data is that the individuals in the latter condition continued putting significant effort to improve their performance even though they were not being encouraged to do so (Venables & Fairclough, 2009).

To summarize, employee reactions can facilitate or hinder the effectiveness of performance appraisals. Studies that examine reactions to performance management are scarce. To our knowledge, the study by Rock et al., (2014) and Venables and Fairclough (2009) are the single studies on this matter. Further research is required to understand how neuroscience can contribute to the field of performance management. New research that uses neuropsychological methods could fill a gap in the literature. They can give us an idea of peoples' conscious and unconscious reactions to performance management (Guinea et al., 2013 ; Guinea et al., 2014). Using neuropsychological methods in combination with behavioral methods would surely limit biases such as social desirability.

Chapter 3: Thesis Article

3.1. Introduction

Plagued with constant dissatisfaction of employees and managers towards performance management systems (Adler et al., 2016; Murphy, 2019), organizations have begun looking for original and effective ways to evaluate and manage employee performance. Some firms have chosen to abandon performance ratings and move towards agile and continuous performance feedback systems to support employee performance (Deloitte, 2017b; Buckingham & Goodall, 2015; Darino, Sieberer, Vos & Williams, 2019). In fact, approximately 70% of multinational companies are moving away from traditional performance management practices (Cappelli & Tavis, 2016). However, these new management practices are not based on sufficient empirical evidence, and when evidence is available, it often leads to inconsistent findings. For instance, a recent survey by the Corporate Executive Board (2016) showed that organizations have been abolishing ratings because they believe that employees will become more engaged without them, and that managers will have more frequent and high-quality conversations with their employees. However, it seems that abolishing ratings can lead to a decrease in employee performance of up to 10% (Corporate Executive Board, 2016). Furthermore, abandoning ratings can result in less frequent conversations between managers and employees and the quality of these conversations tend to suffer (Corporate Executive Board, 2016; Wiles, 2019). These findings clearly cast doubt on the effectiveness of ratingless performance management systems.

Also, in the quest for more agile performance management practices, recommendations for providing employees with high-quality feedback to improve their performance are abundant (Darino, Sieberer, Vos & Williams, 2019; Lechermeier & Fassnacht, 2018), as we are constantly reminded that employees need regular contact with their manager to obtain information about their performance and improve themselves (Freyermuth & Lougee, 2019). However, providing employees with continuous performance feedback can be very challenging for managers. Most of them often lack the skills to convey performance feedback efficiently, and many hold negative beliefs towards the efficacy of such practices (Baker, Reid & Blanchard, 2013; Brutus & Gosselin, 2007). Moreover, although most organizations still rely on these face-to-face conversations

between managers and employees to deliver performance feedback, recent technological developments have pushed some firms to use electronic performance tools and appraisals instead (Levy, Tseng, Rosen & Lueke, 2017; Ravid, Tomczak, White & Behrend, 2020). For instance, General Electric has developed a mobile application where managers can administer feedback electronically (Proctor & Alamanza, 2017; Zeng, 2016). Despite this trend, too few studies have looked at the impacts of continuous performance feedback and the influence of the medium through which it is conveyed.

In sum, even though case studies and anecdotal evidence of these emerging practices have been reported in the media (Wilkie, 2015), more research is clearly needed to ascertain the effectiveness of these new performance management practices. To address these gaps in the literature, we build on control theory to improve our understanding of the interplay between these practices and their impacts on performance outcomes such as employee performance, motivation to improve performance and task engagement.

3.1.1. Theoretical framework

Control theory is particularly relevant in a performance management context, as it suggests that individuals tend to compare their current performance to a referent or a desired state (Campion & Lord, 1982; Lord & Levy, 1994; Kernan & Lord, 1990; Powers, 1973). More specifically, it posits that individual performance standards will be influenced by one's personal beliefs and by the information about their performance that people receive from their environment (*e.g.* their supervisor) (Campion & Lord, 1982). Should any discrepancy appear between the current and desired states of performance, individuals will try to act upon, *i.e.* control, the situation to restore optimal levels of performance (Campion & Lord, 1982; Lord & Levy, 1994; Kernan & Lord, 1990; Marken & Carey, 2015; Powers, 1973). The idea of control here is clear; people are motivated to restore balance between the information that is conveyed to them through their environment and their personal standards of performance (Campion & Lord, 1982; Powers, 1973). This desire to control performance seems to be most salient in a context where people are underperforming (Marken & Carey, 2015). This is where performance ratings and feedback can come in handy as they can be used as information to help correct low performance. As people use the information (i.e. ratings and feedback) at their disposal and put effort, the gap between their current and desired performance decreases,

control is established, and satisfactory levels of performance can be maintained in the long run (For the theoretical model consult Model 1 in Appendix A.0).

Some studies have observed that performance ratings can have negative effects on employee performance and their reactions (Adler et al., 2016; Davis, Rock & Jones, 2014). Still, there is evidence that removing performance ratings can also result in poor performance (Corporate Executive Board, 2016; Goler, Gale & Grant, 2016). This may be explained by the fact that, by removing ratings, employees lose important information that can help them position themselves in relation to their performance. Under a control theory lens, performance ratings can act as a comparative mechanism that employees use to situate themselves, especially when employees are not meeting expectations (Campion & Lord, 1982). More specifically, the desire of employees to meet their goals or their desired state of performance, can be conceived as a form of motivation, as they are naturally pushed to use the information that they receive (ratings) to compensate for unsatisfactory performance. Because of this process, we believe that ratings can also increase people's engagement (e.g. cognitive effort) when they are underperforming as people are likely to invest more cognitive resources to compensate for low performance. Hence, we argue that performance ratings have the potential to enhance employees' performance, their motivation to improve and their task engagement, as they will make the necessary adjustments when they sense that they are not meeting performance standards. Building on the above arguments, we hypothesize that :

H1a. Receiving performance ratings is associated with heightened levels of performance.

H1b. Receiving performance ratings is associated with higher motivation to improve performance.

H1c. Receiving performance ratings is associated with higher levels of task engagement.

Performance feedback also has the potential to significantly improve performance, as high-quality messages can help employees reach higher levels of performance and realize their true potential at work (Cummings, Schwab, & Rosen, 1971; Gasperini, 2013). Conversely, when performance feedback is not conveyed in a diligent manner, it may generate negative reactions (Pichler, 2018) because the message employees receive

during performance appraisal can be perceived as unfair and biased (Vaset, Marnburg & Furunes, 2010; Mackenzie, Weher & Corell, 2019). These reactions might be exacerbated when employees perform poorly because of the large gap that low-quality feedback can create between people's expected performance level and the one that is communicated to them. However, when high-quality feedback is delivered to employees, managers can reverse the pervasive effects of bad feedback and help employees achieve stable levels of performance (Aguinis, Gottfredson & Joo, 2012; Brutus & Gosselin, 2007; Carpentier & Mageau, 2013). Hence, based on control theory, people will use the information in the feedback they receive to foster cognitive and behavioral change, therefore improving their performance (Campion & Lord, 1982; Lord & Levy, 1994).

But there are different sources from which employees can receive feedback such as computers or humans. Some studies explain that computer-mediated feedback is superior to person-mediated feedback as it is positively associated with performance (Earley, 1988; as cited in Stone, Deadrick, Lukaszewski & Johnson, 2015). In addition, computer-mediated feedback seems to motivate people to improve their performance when they are learning (Baytak et al., 2017), especially when computer-mediated feedback targets learners' specific needs for improvement (Sherafati, Largani & Amini, 2020). Computer-mediated feedback is motivating, and it centers people's attention towards their tasks (Stone, Deadrick, Lukaszewski & Johnson., 2015) which makes it more engaging and fosters greater autonomy (Zarei & Hashemipour, 2015). And, according to control theory, when people's individual independance is promoted, people are more likely to improve their performance (Marken & Carey, 2015). Building on these results, and from a control theory perspective, we suggest that computer-mediated feedback will have a great influence on performance, motivation and engagement because it will be perceived as a tool that promotes individual autonomy. Employees may feel more constrained when they receive person-mediated feedback, and there is evidence that person-mediated feedback tends to deteriorate performance (Golke, Dörfler & Artelt, 2015; Leutner, Fleischer, Grünkorn & Klieme, 2017; Marken & Carey, 2015). Given these arguments, we suggest that computer-mediated feedback will have beneficial effects on employee performance, motivation to improve performance and task engagement. Thus we hypothesize that :

H2a. Computer-mediated feedback will have a greater impact on performance.

H2b. People will be more motivated to improve their performance when they receive feedback from a computer.

H2c. People will feel most engaged towards their task when they receive feedback from a computer.

3.2. Method

3.2.1 Design

The present study adopted a mixed 2x3 factorial design containing between- and within- subjects' factors. Participants were divided into two independent groups: rated versus unrated participants. Rated participants received a numerical rating based off their performance on each block of the task and the unrated group did not receive any ratings during the task. Within each of these groups, participants received feedback from different sources: a computer, a person and no source after each block in the task (See Appendix A.1: Illustration 1).

3.2.2. Participants

Among the thirty-eight participants that were recruited for this study, two were eliminated from the final sample as they had bad response patterns ($Z > \pm 3$) during the task (Utts & Heckard, 2011). Our participants ($n = 36$) were between 18 and 41 years of age ($M = 24.64$, $SD = 4.67$) and mostly university students or recent graduates. Authorization to solicit participants was obtained from the research ethics board of our institution. Prior to the experiment, deception was used; participants were explained that they could earn a higher compensation than what was advertised, that is, a 40$CAN Amazon gift-card. In other words, right before the experiment, participants were explicitly told that they would receive a higher compensation if they performed well on the task, but the final compensation was the same for all our subjects. After the experiment, all participants were debriefed and compensated with a 50$ Amazon gift-card. The participants were healthy and screened to ensure that they had corrected to normal eye vision and no hearing difficulties. We excluded participants who declared that they had a psychiatric or neurological disorder (e.g. epilepsy) as well as individuals who declared that they had a physical health problem (e.g. cardiac disorder). Each group contained sixteen participants with a similar age range ($M_{Rated} = 25.00$, $SD_{Rated} = 5.80$; $M_{Unrated} =$

24.28, $SD_{Unrated}$ = 3.30). The number of females was higher in the rated group (7 males and 11 females) but was equal in the unrated group (9 males and 9 females).

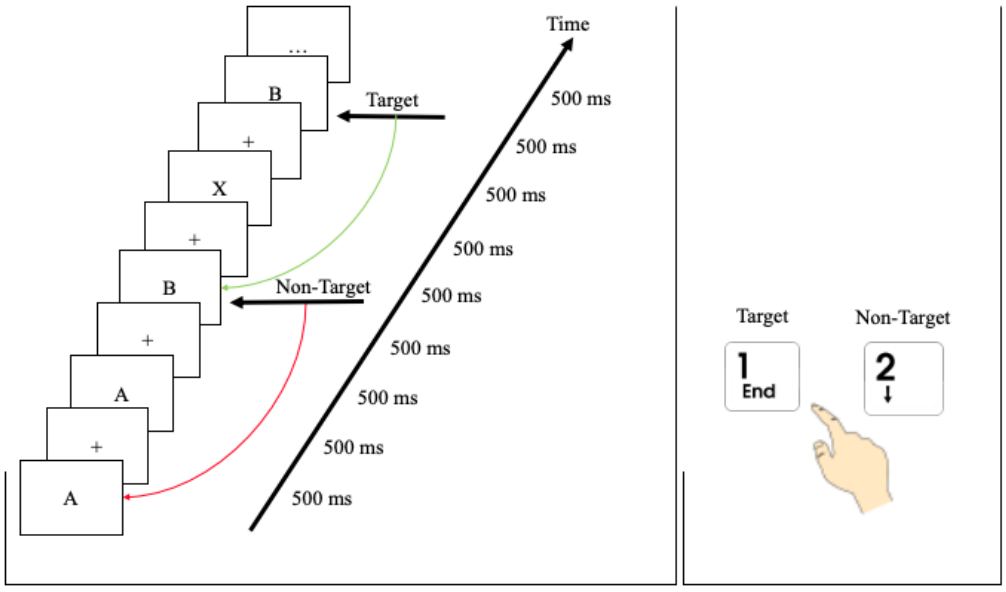
3.2.3. Task and stimuli

3.2.3.1. The experimental n-back Task

An n-back task was used through E-Prime Software (Psychology Software Tools Inc, 2016). The n-back task is a cognitive performance task that is commonly used in psychology and neuroscience; it assesses the working memory capacity of individuals (Gajewski, Hanisch, Falkenstein, Thönes & Wascher, 2018; Scharinger, Soutschek, Schubert & Gerjets, 2017).

During the task participants were presented with a series of letters and they had to decide whether the present stimulus (i.e. letter) was congruent with the one they saw two trials ago (2-back version) (Gajewski Hanisch, Falkenstein, Thönes & Wascher, 2018). The stimulus was presented every 500ms and an interonset interval of 500ms was set (Zhang & Liao, 2019) as opposed to the default settings of 500ms and 2500ms to create a state of underperformance. The stimuli were presented sequentially at the center of the computer screen. When the stimuli were congruent or incongruent, participants could press one of two keyboard buttons to confirm the presence or the absence of a match (See illustration below).

Illustration 2. *n-back task (2-back version).*



Participants would only know their performance when the block was complete, and the stimuli matched on approximately 25% of the trials. For each condition, there were 4 blocks and each block contained 25 trials. The order of presentation for the experimental blocks were counterbalanced to reduce transfer effects. In other words, participants received computer-mediated feedback, human-mediated feedback or no-feedback four times consistently, but the order in which these chunks of blocks appeared was random.

3.2.3.2. Performance Ratings and Feedback

In the experiment, participants in the rated group received a numerical performance rating on their screen which was followed by feedback after each completed block. The rating was displayed to participants in percent form and was calculated based off their accuracy on the task. Participants' performance was calculated and displayed for each separate block. Participants in the unrated group simply continued carrying on with the task without ever being presented a rating. All participants were exposed to performance feedback from different sources.

The feedback that was provided to participants was in the form of a script. Scripts were developed based on the change-oriented feedback model of Carpentier and Mageau, (2013) to ensure the transmission of high-quality performance feedback to all participants regardless of the feedback source. Change-oriented feedback is a type of feedback that seeks to help underperforming individuals achieve optimal levels of performance and to foster individual autonomy (Carpentier & Mageau, 2013) (See Appendix A.2. for sample and assumptions). The feedback scripts in the computer-mediated condition would appear as a pop-up on the computer screen that the participant could read, whereas the feedback scripts in the human-mediated condition would be read verbatim to the participant by the same experimenter for all participants. In the condition where they received no feedback, participants carried on with the task, but participants were allowed to take short breaks in between blocks.

3.2.3.3. Adaptive Testing

The n-back task was adapted in this experiment to put participants in a situation of underperformance as we sought to create a challenging task that would limit high performance and ensure that our change-oriented feedback would not be out of context.

Stimuli were presented quickly to prevent participants from achieving a perfect score. In our pre-test (n = 4), we ensured that on average our participants would receive an accuracy level of 80%. This approach was necessary to ensure that the change-oriented feedback that would be presented by the computer or the experimenter would be impactful. However, in order to prevent frustration, the task was also designed to slowly adapt to participants performance. For instance, after a block would be completed in the experiment, participants with lower performance were given more time to respond after the presentation of each stimulus; which gave them time to "catch-up". For example, participants who had performance under 65% were given 2000ms to respond instead of 1500ms and participants who had very high performance above 80% were given 1000ms to respond instead of 1500ms. This approach would avoid low performers from giving up, but it also limited the possibility of higher performers to achieve a perfect score of 100% and it would also prevent them from diverting their attention away from the task.

3.2.4. Dependent Variables

3.2.4.1. Performance

Behavioral measures were collected during the experiment through the E-Prime software. Performance was extracted after each block that the participant had conducted in the experimental task and was calculated as a percentage of the number of correctly identified matches and mismatches by the participant.

3.2.4.2. Motivation to Improve Performance

Psychometric measures were also extracted, such as motivation to improve, which was measured in two different ways. First, the Motivation to Improve Performance Scale by Fedor, Eder and Buckley (1989) was used to measure participants' motivation after receiving feedback from the different feedback sources. It is a 5-point Likert scale where 1 represents that participants "strongly agree" and 5 represents that participants "strongly disagree". Thus, a lower score demonstrates higher levels of motivation to improve and vice versa. The scale has three items; here is a sample item, "The feedback encouraged me to improve my performance" (See Methodological Appendix : Section A.3.).

Second, the rated group completed an additional scale that measured their motivation to improve performance following the presentation of a rating as well. In order to do so, we adapted the scale of Fedor, Eder and Buckly (1989) and replaced the word

"motivation" in the items for the word "rating". Here is a sample item from our adapted scale, "The rating encouraged me to improve my performance" (See Methodological Appendix : Section A.3.).

3.2.4.3. Task Engagement

During the experiment, we collected electroencephalographic (EEG) data to extract our participants' levels of engagement. Engagement in the present context can be defined as " a fundamental dimension of user psychology related to human performance" and it mainly reflects the cognitive effort or the energy that is directed towards a task to complete a goal (Fairclough, Gilleade, Ewing & Roberts, 2013). In the current study, we measured participants levels of engagement by using the index developed by Pope and his colleagues (Pope, Bogart & Bartolome, 1995; Mikulka, Scerbo & Freeman, 2002; Bailey, Scerbo, Freeman, Mikulka & Scott, 2006). This index is believed to be a a psychophysiological inference of the cognitive engagement construct (Courtemanche et al., 2019) and has been extensively validated through auto-adaptive simulators (Pope, Bogart & Bartolome, 1995).

Our EEG measures were acquired by setting up 32 electrode EEG montage (Brain Products, Germany). Our data was acquired at 500 Hz and then was sampled down to 250 Hz in real-time. Impedances were kept below 50 kΩ. Data was filtered offline with a low pass IIR filter at 20Hz and a high pass IIR filter at 1Hz. Filters for blink artefacts were applied, as well as filters for vertical and horizontal saccades (Jung et al., 2000). Afterwards, we used Fast Fourier Transform analyses with 1 second epochs to extract three types of brainwave activity: theta (θ) [4-8 Hz], alpha (α) [8-12 Hz] and beta (β) [14-20 Hz], which were necessary to compute our participants levels of engagement.

Engagement was calculated by extracting brain activity on four electrode sites, Cz, Pz, P3, and P4 (Bailey, Scerbo, Freeman, Mikulka & Scott, 2006). These electrode sites were chosen as they have been found to be the most effective at calculating engagement and are closest to Pope's method (Bailey, Scerbo, Freeman, Mikulka & Scott, 2006; Pope, Bogart & Bartolome, 1995). The following formula was used: $\beta / (\alpha+\gamma)$ (Chouachi, Pierre, Jraidi & Frasson, 2010), which has been empirically validated (Freeman, Mikulka, Prinzel & Scerbo, 1999). Its values range from 0 to 1; higher values demonstrating higher levels of engagement/cognitive effort and vice versa.

3.2.5. Procedure

The study was completed in eight different steps. First, subjects were recruited by using online platforms of our institution. Second, participants who consented to participate were guided to complete a screening survey on Qualtrics (criteria are presented 3.2.2). Qualifying participants were then scheduled, one at a time, for an appointment at the laboratory. Third, at the time of the appointment, each participant was greeted, and their eligibility was reviewed to ensure they still qualified for the experiment. Fourth, the participant was then brought to a sound-proofed experimentation room where he/she was instructed to sit on a chair while the experimenter would place the EEG cap on their head and connected each electrode with water-soluble gel. Fifth, after the EEG cap was placed, the participant was set in place for the experimental n-back task. Sixth, after completing the task, the participant had to fill a post-test questionnaire on Qualtrics that evaluated their reactions to performance appraisal (i.e. motivation to improve and task engagement). Seventh, participants were then greeted out of the sound-proofed room and were debriefed. Finally, they were brought to a washroom where they could wash their hair. They were then given their compensation for their time and escorted out of the laboratory.

3.3. Analyses

Experimental data were analysed using SPSS v.23. (SPSS Inc.). Mixed analyses of variance (mixed ANOVAs) with repeated measures were conducted to compare the effect of performance ratings (rated *vs* unrated groups) and feedback source (computer *vs* person *vs* none) on participants' performance and their reactions (i.e. motivation to improve performance following feedback and task engagement). Violations of homogeneity of variances and sphericity were not detected using Mauchly's Test and Levene's test; statistical corrections were not necessary.

A one-way repeated measures analysis of variance (one-way ANOVA) was conducted to examine the impact of performance ratings on motivation to improve performance following a rating in the three different experimental conditions. Violations of sphericity were not detected using Mauchly's Test; statistical corrections were not necessary. (See statistical Assumptions for each analysis in Appendix A.4).

The analyses are presented per dependent variable as a specific analysis was conducted for each of the four outcomes analyzed, respectively performance, motivation to improve performance following a rating and task engagement[1].

3.4.Results

3.4.1. The Effect of Ratings and Feedback Source on Performance

A 2 x 3 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and three within subject factors of feedback source (computer, person, and none) was conducted to examine the effects of the independent variables (performance ratings and feedback source) on the dependent variable (performance).

Results demonstrated that there was a statistically main effect for ratings (F (1, 34) = 4.115, p = .05, η_p^2 = .11) and Bonferroni pairwise comparisons show that were participants in the rated group (M = 81.43, SD = 4.84) scored higher than the unrated group (M = 77.89, SD = 5.60). Thus, hypothesis H1a, which stipulated that receiving ratings would increase performance, was confirmed.

Our results also showed a statistically main effect of feedback source (F (2, 68) = 8.34, p < .01, η_p^2 = .18). Bonferroni pairwise comparisons revealed a statistically significant difference between computer-mediated and person-mediated feedback (p < .01) as participants scored higher when they received feedback from a person (M = 82.28, SD = 6.88) than when they received feedback from a computer (M = 77.31, SD = 8.32). However, no differences were observed with the no feedback condition (M = 79.39, SD = 5.43). Thus, hypothesis H2a which specified that computer-mediated feedback would be the most beneficial for performance, was rejected as person-mediated feedback was most beneficial (For descriptive and inferential statistics, figures and tables, see appendix B.1, Figures 1 to 3 and Tables 1 to 6).

[1] *The sample size for our analyses on performance, motivation to improve performance following feedback and appraisal satisfaction is 36. Our sample size for our analysis on engagement was reduced to 32 because of low quality recordings for some participants.*

3.4.2. *The Effect of Ratings and Feedback Source on Motivation to Improve Performance Following a Performance Rating*

A one-way repeated measures analysis of variance (ANOVA) with three within subject factors of motivation to improve following a rating (computer, person, and none) was conducted to examine the effects of the independent variables performance ratings and feedback source on the dependent variable, motivation to improve (after receiving a rating).

The results of the analysis showed there was no main effect of rating on motivation to improve performance following the presentation of a rating, regardless of feedback source (F (1,17) = 2.21, p = .13, η_p^2 = .12) (See Appendix B.1, Figure 4). Thus, hypothesis H1b, which stipulated that receiving ratings would result in higher motivation to improve, was rejected (For descriptive and inferential statistics, figures and tables, see appendix B.1, Figures 4 and Tables 7 to 8).

3.4.3. The Effect of Ratings and Feedback Source on Motivation to Improve Performance Following Performance Feedback

A 2 x 2 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and two within subject factors of feedback source (computer and person) was conducted to examine the effects of the independent variables performance ratings and feedback source on the dependent variable motivation to improve performance following feedback. As mentioned in the measures section 3.2.4.2, the scale is reversed, thus a score closer to 1 represents greater motivation and a score closer to 5 represents lower motivation.

Our results demonstrate that there was no statistically main effect of ratings (F (1, 34), = .89, p = .44, η_p^2 = .02), but that there was a statistically significant main effect of motivation to improve following feedback (F (2, 68) = 20.19, p < .01, η_p^2 = .37). Bonferroni pairwise comparisons showed that participants felt significantly less motivated to improve on the task when they received feedback from a computer (M = 2.87, SD = .95) than when they received feedback from a person (M = 2.21, SD = .96). Therefore, hypothesis H2b was rejected, because participants were most motivated to improve their performance when they received feedback from a person rather than a

computer (For descriptive and inferential statistics, figures and tables, see appendix B.1, Figures 5 to 7 and Tables 9 to 13).

3.4.4. The Effect of Ratings and Feedback Source on Task Engagement

A 2 x 3 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and three within subject factors of feedback source (computer, person, and none) was used to examine the effects of the independent variables performance ratings and feedback source on the dependent variable task engagement.

Results show that there was no main effect for rating (F (1, 31) = .61, p .43, η_p^2 = .02), resulting in the rejection of hypothesis H1c which explained that performance ratings would increase task engagement. However, the data demonstrated that there was a statistically significant main effect for feedback source on task engagement (F (2, 62), = 4.028, p = .02, η_p^2 = .12). Bonferroni pairwise comparisons were conducted across feedback source, and showed that only the mean difference between computer-mediated and person-mediated feedback was statistically significant (p = .02). Participants tended to be more engaged towards the task when they received feedback from a person (M = .66, SD = .21) than from a computer (M = .61, SD = .19). No differences were observed for the no feedback condition (M = .62, SD = .19). Thus, hypothesis H2c which stipulated that participants would be more engaged towards the task after receiving feedback from a computer was rejected, as they were most engaged when they received feedback from a person (For descriptive and inferential statistics, figures and tables, see appendix B.1, Figures 8 to 10 and Tables 14 to 17).

3.5. Discussion

The current study drew from control theory (Campion & Lord, 1982; Lord & Levy, 1994; Kernan & Lord, 1990; Marken & Carey, 2015; Powers, 1973) to examine how novel performance management practices such as abandoning performance ratings and continuous performance feedback from different sources are associated with employee outcomes, such as performance, motivation to improve and task engagement. Three key insights emerge from our study. First, our results corroborate findings in the performance management literature asserting the positive influence of continuous performance feedback (Aguinis, Gottfredson and Joo, 2012; Carpentier and Mageau, 2013; van

Woerkom & Myers, 2015), while offering a strong theoretical rationale for these results. Control theorists have demonstrated that when people are in a state of underperformance individuals are more likely to delegate cognitive, behavioral and attentional resources to their tasks when they receive feedback (Bandura & Cervone, 1983, 1986; Campion & Lord, 1982; Kernan & Lord, 1988; Kernan & Lord, 1990; Matsui, Kakuyama & Onglatco, 1987, Matsui, Okada & Inoshita, 1983).

Second, our results go further and contribute to the field by showing that people demonstrate higher levels of performance, motivation to improve and task engagement when they receive continuous performance feedback from a human being compared to a computer. These results are worth noting, as our dependent variables respectively captured objective and neuro-psychological measures of performance and task engagement; therefore, going beyond perceptual measures used in previous studies (e.g. Roberson & Stewart, 2006; Selvarajan & Cloninger, 2012). Keeping control theory in mind, these discrepancies could be explained by the idea that when employees are in a state of underperformance, person-mediated feedback may be more salient because managers can grab their attention and convey the relevant information employees need to correct low performance immediately. Person-mediated feedback pushes employees to stop and internalize the information about their performance and this information is accompanied by affective and social information that a computer cannot convey. These findings are at odds with previous studies (Baytak et al., 2017; Kluger & Adler, 1993; Sherafati, Largani & Amini, 2020; Stone, Deadrick, Lukaszewski & Johnson., 2015; Zarei & Hashemipour, 2015) and clearly suggest the need for further research on the boundary conditions of feedback sources. For example, it may be that receiving computer-mediated feedback is only effective under certain conditions like high performance, or for specific tasks. Also, in a repeated task setting, computer-mediated feedback may yield habituation effects more rapidly; that is individuals will tend to omit, disregard, or ignore information that is being conveyed to them from their environment (Bouton, 2007). Under a control theory lens, people cannot correct their performance in a purposeful way when they ignore pertinent information from the surrounding environment (Campion & Lord, 1982). Finally, along previous studies on electronic performance monitoring asserting that computers cannot completely replace human feedback, nor should be the single source of

performance feedback for employees (e.g. Adler & Ambrose, 2005), we suggest that future studies take a closer look at the interplay between computer mediated-feedback and others feedback sources (e.g. supervisor's, colleagues, clients).

Third, contrary to popular opinion which pushes for the abandonment of performance ratings because of their supposed deleterious effects on employee outcomes (Adler et al., 2016; Rock, Davis & Jones, 2014), and because they are temporally and financially taxing (Bhatnagar & Bhagyalkshmi, 2016; Brecher, Eerenstein, Farley & Good, 2016; Buckingham & Goodall, 2015; Deloitte, 2017a), our results depicted a more positive story about performance ratings, as they contributed to task performance. According to control theory, when employees receive ratings, they will compare their current performance to their past or desired state of performance and make adjustments based off perceived gaps in performance. Thus, in a situation of underperformance, instead of discouraging employees, ratings will actually push them to reach optimal output levels. We therefore suggest great caution for organizations thinking about abandoning performance ratings because it might remove valuable performance information from employees (Adler et al., 2016) and hinder any possibility of improvement. Furthermore, in the absence of ratings, employees will have difficulty knowing which behaviors to change in order to attain the expected level of performance (Campion & Lord, 1982; Marken & Carey, 2015). These arguments could explain why some firms that abandoned ratings have experienced decreases in employee performance (Corporate Executive Board, 2016). Nevertheless, we do acknowledge that although ratings may spark negative perceptions or reactions (Adler et al., 2016), the manner in which ratings are implemented seems to make a bigger difference in terms of how employees will react (Goler, Gale & Grant, 2016), than the sole question of abandoning them or not. For example, some firms have used ratings in the past to rank employees, a system that have been shown to foster unfairness perceptions among employees (Bhatnagar & Bhagyalkshmi, 2016; Deloitte, 2017a). Thus, it would seem that managers can avoid negative employee reactions if they implement performance ratings in a way that promotes fairness (Goler, Gale & Grant, 2016).

3.6. Limitations, Future Directions and Conclusion

The present study did not come without limitations. First, the n-back task is great to assess working memory capacity (Gajewski, Hanisch, Falkenstein, Thönes & Wascher, 2018), but it focuses on this single dimension of cognition. In the workplace, employees not only use their working memory, but also other executive functions such as problem solving, inhibition, self-control, and cognitive flexibility (Diamond, 2013; Drigas & Karyotaki, 2019). This tends to be the case especially for service-based jobs where problem solving skills are often solicited (Jonge & Dormann, 2003). Future research could thus examine the potential impacts of performance ratings and feedback with a greater variety of cognitive tasks that assess multiple dimensions of people's executive functioning like the *Stroop Task* and the *Wisconsin Card Sorting Task* which examine people's inhibition, cognitive flexibility and problem solving skills (Diamond, 2015; Ray, 1955). It would also be especially relevant to examine how people would perform on these tasks in a field setting instead of an experimental setting. Perhaps researchers who study performance management while using these tasks will be able to measure more complex and complete reactions.

Second, the study's external validity is limited by the characteristics of its sample. We recruited students and recent graduates from local universities in Montreal. Also, even though our simulations were developed as rigorously as possible and they allowed us to obtain objective performance and neuropsychological measures, it is important to keep in mind that a laboratory experiment cannot fully recreate the richness of appraisal in a real context. For example, in our study, performance ratings and feedback were administered right after a participant completed a block, whereas in real life there would be longer delays. A longitudinal study in real work environment that could capture performance ratings occurrence (e.g. semi-annual or annual) and performance feedback episodes (e.g. monthly, quarterly) (Armstrong, 2017; Deloitte, 2017a), would surely contribute to our understanding of these practices. Furthermore, computer-mediated feedback might have had more impact on our participants performance and reactions if displayed in another format, like if an avatar personified a manager, instead of plain text. For instance, user-experience research shows that people tend to comply more with instructions when they receive advice from an avatar with human like traits, compared to when they read the

same information through text (op den Akker, Klaasseen & Nijholt, 2016). This may provide future researchers with important anchors to examine how avatars could be used in the context of performance management.

In the present study we were able to better understand how people perform with and without performance ratings and, under different conditions of performance feedback in challenging situations. We found that performance ratings contribute to performance in a context of underperformance and we should therefore think twice before abandoning them. Perhaps, it is best to adapt the way that they are implemented in firms so that managers can dampen possible negative reactions that have been popular in the media. Ratings are often our "best bet" at objectively measuring job performance and helping employees improve themselves continuously (Adler et al., 2016). We also found that person-mediated feedback is the best way to drive employee performance, motivation and engagement. Thus, managers shouldn't forget the supportive influence they can have on their employee's performance by providing them with information about their performance. Afterall, feedback not only helps employees achieve higher levels of performance, but it also helps employees achieve the best version of themselves (Corporate Executive Board, 2016; Cummings, Schwab & Rosen, 1971; Gasperini, 2013; Wiles, 2019).

Chapter 4: Conclusion

The current study attempted to shed some light on the impacts of two emerging performance management practices, (1) the abandonment of performance ratings and (2) the use of continuous performance feedback on employee performance and their reactions. We focused on these practices in part because firms are implementing them even though the literature doesn't offer sound theoretical basis or empirical proofs of their effectiveness. To that matter, the current study provided a theoretical framework that improves our understanding of why and how these practices can be beneficial to employee performance, motivation to improve and task engagement. Our results showed that performance ratings can positively drive performance, even in situations of underperformance. Furthermore, we found that, providing people with continuous feedback is helpful to increase employees' performance, motivation to improve and task engagement. Simply put, receiving feedback from an automated source cannot compensate for the relational and affective dimensions that a manager can bring. While it is true that the novel practices studied may have been shaped by changes in the workforce composition, the nature of work and the alignment of development practices, ratings and continuous feedback are one of many solutions firms are trying to apply to improve how they manage employees' performance. For instance, crowd-source feedback and employee coaching certainly represent other emerging performance practices that are worthy of more research. Crowd-source feedback involves sharing and evaluating employee performance by multiple persons in the organization who hold positions at different levels (upwards, downward and peer-to-peer) (Caruso, 2017), and coaching involves an employee (coachee) working one-on-one with their manager (coach) to improve their job performance and grow over time in the organization (Gregory & Levy, 2010). Investigating the impacts of such practices on employee's objective performance and their reactions could be worthwhile, especially since we found that practices that are person-oriented can have positive outcomes. Perhaps creating an experiment that examines the performance of employees in response to coaching and/or crowd-source feedback compared to those who do not benefit from such practices could be an interesting start. We hope that the current work will stimulate research where people are at the center of managing performance.

Bibliography

Adler, S., Campion, M., Colquitt, A., Grubb, A., Murphy, K., Ollander-Krane, R., & Pulakos, E. D. (2016). Getting rid of performance ratings: Genius or folly A debate. *Industrial and Organizational Psychology*, *9* (2), 219-252.

Adobe. (2017). Performance reviews get a failing grade. Retrieved from : https://www.slideshare.net/adobe/full-study-performance-reviews-get-a-failing-grade?from_action=save

Aguinis, H. 2013. *Performance management* (3rd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Aguinis, H., Gottfredson, R. K., & Joo, H. (2012). Delivering effective performance feedback: The strengths-based approach. *Business Horizons*, *55*(2), 105-111.

Alam, M., & Singh, P. (2019). Performance feedback interviews as affective events: An exploration of the impact of emotion regulation of negative performance feedback on supervisor–employee dyads. *Human Resource Management Review*, 100740.

Alder, G. S., & Ambrose, M. L. (2005). An examination of the effect of computerized performance monitoring feedback on monitoring fairness, performance, and satisfaction. *Organizational Behavior and Human Decision Processes*, *97*(2), 161-177.

Alton, L. (2018). Workplace Changes Are Accelerating: Why And What Millennials Should Do About It. Retrieved 27 April 2020, from https://www.forbes.com/sites/larryalton/2018/02/01/workplace-changes-are-accelerating-why-and-what-millennials-should-do-about-it/#5e2c39592def

Armstrong, M., & Taylor, S. (2017). Armstrong's handbook of human resource management practice : Building sustainable organizational performance improvement. (14th ed). London, UK : Kogan Page Publishers.

Bailey, N. R., Scerbo, M. W., Freeman, F. G., Mikulka, P. J., & Scott, L. A. (2006). Comparison of a brain-based adaptive system and a manual adaptable system for invoking automation. *Human factors*, *48*(4), 693-709.

Baker, A., Perreault, D., Reid, A., & Blanchard, C. M. (2013). Feedback and organizations: Feedback is good, feedback-friendly culture is better. *Canadian Psychology/Psychologie Canadienne*, *54*(4), 260-268.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist*, *37*(2), 122-147.

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of personality and social psychology*, *45*(5), 1017-1028.

Baytak, A., Tarman, B., & Ayas, C. (2011). Experiencing technology integration in education: children's perceptions. *International Electronic Journal of Elementary Education*, *3*(2), 139-151.

Bhatnagar, M., & Bhagylakshmi, K. (2016). *Tectonic shift in talent retention : The Adobe way.* Harvard Business Review. No. 416-0018-1. Bangalore, India: Amity Research Centers.

Bhave, D. P. (2014). The invisible eye? Electronic performance monitoring and employee job performance. *Personnel psychology*, *67*(3), 605-635.

Bouton, M. E. (2007). Learning and behavior: A contemporary synthesis. Sinauer Associates.

Bradley, L. M., & Ashkanasy, N. M. (2001). Formal performance appraisal interviews: Can they really be objective, and are they useful anyway?. *Asia Pacific Journal of Human Resources*, *39*(2), 83-97.

Brecher, D., Eerenstein, J., Farley, C & Good, T. (2016*). Is performance management performing?* Accenture

Brutus, S. & Gosselin, A. (2007). Chapitre 7. Le feed-back en milieu de travail. Dans : Sylvie Saint-Onge éd., *Gestion des performances au travail: Bilan des connaissances* (pp. 295-330). Louvain-la-Neuve, Belgique: De Boeck Supérieur. doi:10.3917/dbu.onge.2007.01.0295.

Buckingham, M., & Goodall, A. (2015). Reinventing performance management. *Harvard Business Review*, *93*(4), 40-50.

Campion, M. A., & Lord, R. G. (1982). A control systems conceptualization of the goal-setting and changing process. *Organizational behavior and human performance*, *30*(2), 265-287.

Cappelli, P., & Conyon, M. J. (2018). What do performance appraisals do?. *ILR Review*, *71*(1), 88-116.

Cappelli, P., & Keller, J. R. (2014). Talent management: Conceptual approaches and practical challenges. *Annual Review of Organizational Psychology and Organizational Behavior.*, *1*(1), 305-331.

Cappelli, P., & Tavis, A. (2016). The performance management revolution. *Harvard Business Review*, *94*(10), 58-67.

Cardy, R.L. and Dobbins, G.H. (1994), Performance Appraisal: Alternative Perspectives. Cincinnati, OH: South-Western Publishing Company.

Carpentier, J., & Mageau, G. A. (2013). When change-oriented feedback enhances motivation, well-being and performance: A look at autonomy-supportive feedback in sport. *Psychology of Sport and Exercise*, *14*(3), 423-435.

Carter, G., & Delahaye, B. (2005) Performance Appraisal: Stressful for Some. In Davies, D, Fisher, G, & Hughes, R (Eds.) *Engaging the Multiple Contexts of Management - Proceedings of the 19th ANZAM Conference.* Australian and New Zealand Academy of Management, Australia, pp. 1-14.

Caruso, K. (2017). 3 Tips for Implementing Crowd-Sourced Feedback in Performance Review. Retrieved 12 August 2020, from https://web.viapeople.com/viapeople-blog/implementing-crowd-sourced-feedback

Chaouachi, M., Pierre, C., Jraidi, I., & Frasson, C. (2010, May). Affect and mental engagement: Towards adaptability for intelligent. In *Twenty-Third International FLAIRS Conference*.

CIA. (2020). North America : United States, The World Factbook, Central Intelligence Agency. Retrieved 28 April 2020, from https://www.cia.gov/library/publications /the-world-factbook/geos/us.html

Clear Review. (2017). Why 65% of Companies are Still Using Outdated Appraisal Systems. Retrieved from : https://www.clearreview.com/performance-management-study-appraisal-systems/

Colquitt, J. A. (2001). On the dimensionality of organizational justice: a construct validation of a measure. *Journal of applied psychology*, *86*(3), 386-400.

Corporate Executive Board. (2016). *The impact of eliminating performance Management. Washington, DC: Gartner.*

Courtemanche, F., Labonté-LeMoyne, E., Léger, P. M., Fredette, M., Senecal, S., Cameron, A. F., ... & Bellavance, F. (2019). Texting while walking: An expensive switch cost. *Accident Analysis & Prevention*, *127*, 1-8.

Cravens, D. W., Piercy, N. F., & Baldauf, A. (2009). Management framework guiding strategic thinking in rapidly changing markets. *Journal of Marketing Management*, *25*(1-2), 31-49.

Cummings, L. L., Schwab, D. P., & gggg, M. (1971). Performance and knowledge of results as determinants of goal setting. *Journal of Applied Psychology*, *55*(6), 526-530.

Darino, L., Sieberer, M., Vos, A., & Williams, O. (2019). Performance management in agile organizations. *mckinsey. com*.

De Jonge, J., & Dormann, C. (2003). The DISC model: Demand-induced strain compensation mechanisms in job stress. In *Occupational stress in the service professions* (pp. 57-88). CRC Press.

De Guinea, A.O., Titah, R., & Léger, P.M. (2013). Measure for measure: A two study multi-trait multi-method investigation of construct validity in IS research. *Computers in Human Behavior*, *29*(3), 833-844.

De Guinea, A.O., Titah, R., & Léger, P.M. (2014). Explicit and implicit antecedents of users' behavioral beliefs in information systems: A neuropsychological investigation. *Journal of Management Information Systems*, *30*(4), 179-210.

Deloitte. (2017a). Research Report : Continuous performance management. Deloitte Development LLC.

Deloitte. (2017b). *Rewriting the rules for the digital age : 2017 Deloitte global human capital trends*. Deloitte University Press.

DeNisi, A. S., & Pritchard, R. D. (2006). Performance appraisal, performance management and improving individual performance: A motivational framework. *management and Organization Review*, *2*(2), 253-277.

Diamond, A. (2013). Executive functions. *Annual review of psychology*, *64*, 135-168.

Doucet, O., Lapalme, M.E., Morin, D., & Fortin-Bergeron, C. (In Press). *Gérer la performance des employés au travail.* Éditions JFD, Montréal : QC.

Drigas, A., & Karyotaki, M. (2019). Executive Functioning and Problem Solving: A Bidirectional Relation. *International Journal of Engineering Pedagogy (iJEP)*, *9*(3), 76-98.

Earley, P. C. (1988). Computer-generated performance feedback in the magazine-subscription industry. *Organizational Behavior and Human Decision Processes*, *41*(1), 50-64.

Ewenstein, B., Hancock, B., & Komm, A. (2016). Ahead of the curve: The future of performance management. *McKinsey Quarterly*, *2*, 64-73.

Fairclough, S. H., Gilleade, K., Ewing, K. C., & Roberts, J. (2013). Capturing user engagement via psychophysiology: measures and mechanisms for biocybernetic adaptation. *International Journal of Autonomous and Adaptive Communications Systems*, *6*(1), 63-79.

Farr, J. L., Fairchild, J., & Cassidy, S. E. (2013). Technology and performance appraisal. In The psychology of workplace technology (pp. 101-122). Routledge.

Fazio, R. H., & Roskos-Ewoldsen, D. (2005). Acting as we feel. *Persuasion: Psychological insights and perspectives*, 281-303.

Fedor, D. B., Eder, R. W., & Buckley, M. R. (1989). The contributory effects of supervisor intentions on subordinate feedback responses. *Organizational Behavior and Human Decision Processes*, *44*(3), 396-414.

Freeman, F. G., Mikulka, P. J., Prinzel, L. J., & Scerbo, M. W. (1999). Evaluation of an adaptive automation system using three EEG indices with a visual tracking task. *Biological psychology*, *50*(1), 61-76.

Freyermuth, H. et Loungee, M. (2019). *Real-time performance management needs continuous learning*. Gartner.

Gaffney, S. (2005). Career development as a retention and succession planning tool. *The Journal for Quality and Participation*, *28*(3), 7-10.

Gajewski, P. D., Hanisch, E., Falkenstein, M., Thönes, S., & Wascher, E. (2018). What does the n-back task measure as we get older? Relations between working-memory measures and other cognitive functions across the lifespan. *Frontiers in psychology*, *9*, 2208.

Gallup. (2016a). *Millenials want jobs to be development opportunities*. Washington, D.C: Gallup Organization.

Gallup. (2019). Why Employees Are Fed Up With Feedback. Retrieved 29 April 2020, from https://www.gallup.com/workplace/267251/why-employees-fed-feedback.aspx

Gallup. (2020). What 'meaningful feedback' means to millennials. Gallup. Retrieved from : https://www.gallup.com/workplace/284081/meaningful-feedback-means-millennials.aspx

Garr, S., Liakopoulos, A. (2014). *Performance management is broken : Replace "rank and yank" with coaching and development*. Deloitte Insights. Retrieved from : https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2014/hc-trends-2014-performance-management.html.

Garr, S.S & Sanders, E. (2017). *Continuous performance management*. Research Report. Deloitte.

Gasperini, A. M. (2013). Coaching with feedback: helping your team members to grow. Paper presented at PMI® Global Congress 2013—North America, New Orleans, LA. Newtown Square, PA: Project Management Institute.

Goler, L., Gale, J., & Grant, A. (2016). Let's Not Kill Performance Evaluations Yet. *Harvard Business Review*, *94*(11), 90-94.

Golke, S., Dörfler, T., & Artelt, C. (2015). The impact of elaborated feedback on text comprehension within a computer-based assessment. *Learning and instruction*, 39, 123-136.

Gregory, J. B., & Levy, P. E. (2010). Employee coaching relationships: Enhancing construct clarity and measurement. *Coaching: An International Journal of Theory, Research and Practice*, *3*(2), 109-123.

Groover, M. (2007). *Work systems and the methods, measurement and management of work*. Upper Saddle River : NJ. Pearson Prentice Hall.

Gruman, Jamie A., and Alan M. Saks. Performance management and employee engagement.*Human resource management review*, *21*(2),123-136.

Harris, K., Russell, L., & Harris, R. (2015). When Good Goes Bad: The Effects of High Negative Affectivity on Pressure to Produce. *Journal of Management and Strategy*, *6*(3), 1-8.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81-112.

Iqbal, M. Z., Akbar, S., et Budhwar, P. (2015). Effectiveness of performance appraisal: An integrated framework. International Journal of Management Reviews, 17(4), 510-533.

Keeping, L. M., & Levy, P. E. (2000). Performance appraisal reactions: Measurement, modeling, and method bias. *Journal of applied psychology*, *85*(5), 708-723.

Kernan, M. C., & Lord, R. G. (1988). Effects of participative vs assigned goals and feedback in a multitrial task. *Motivation and Emotion*, *12*(1), 75-86.

Kernan, M. C., & Lord, R. G. (1990). Effects of valence, expectancies, and goal-performance discrepancies in single and multiple goal environments. *Journal of applied psychology*, *75*(2), 194-204.

Kinicki, A. J., Jacobson, K. J., Peterson, S. J., & Prussia, G. E. (2013). Development and validation of the performance management behavior questionnaire. *Personnel Psychology*, *66*(1), 1-45.

Kluger, A. N., & Adler, S. (1993). Person-versus computer-mediated feedback. *Computers in human behavior*, *9*(1), 1-16.

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological bulletin*, *119*(2), 254-284.

Kuvaas, B., & Dysvik, A. (2009). Perceived investment in employee development, intrinsic motivation and work performance. *Human resource management journal*, *19*(3), 217-236.

Lechermeier, J., & Fassnacht, M. (2018). How do performance feedback characteristics influence recipients' reactions? A state-of-the-art review on feedback source, timing, and valence effects. *Management Review Quarterly*, *68*(2), 145-193.

Leutner, D., Fleischer, J., Grünkorn, J., & Klieme, E. (2017). Competence assessment in education: An introduction. In *Competence Assessment in Education* (pp. 1-6). Springer, Cham.

Levitt, T. (1983). The Globalization of Markets," *Harvard Business Review,* May—June. P92, 102.

Levy, P. E., Tseng, S. T., Rosen, C. C., & Lueke, S. B. (2017). Performance management: A marriage between practice and science–just say "I do". *Research in Personnel and Human Resources Management, 35,* 155–213.

Linderbaum, B. A., & Levy, P. E. (2010). The development and validation of the Feedback Orientation Scale (FOS). *Journal of Management*, *36*(6), 1372-1405.

London, M., & Smither, J. W. (2002). Feedback orientation, feedback culture, and the longitudinal performance management process. *Human Resource Management Review*, *12*(1), 81-100.

Lord, R. G., & Levy, P. E. (1994). Moving from cognition to action: A control theory perspective. *Applied Psychology*, *43*(3), 335-367.

Mackenzie, L., J. Wehner, & S. Correll. (2019). Why most performance evaluations are biased, and how to fix them. *Harvard Business Review*.

Mandernach, B. J. (2005). Relative effectiveness of computer-based and human feedback for enhancing student learning. *The Journal of Educators Online*, *2*(1), 1-17.

Mankins, M., Brahm, C., & Caimi, G. (2014). Your scarcest resource. *Harvard Business Review*, 92(5), 74-80.

Marken, R. S., & Carey, T. A. (2015). Controlling people: The paradoxical nature of being human.

Mathis, R. L., & Jackson, J. H. (2011). *Human resource management: Essential perspectives*. Cengage Learning.

Mathis, R.L. & Jackson, J.H. (2010) *Human Resource Management.* (13th Ed.) South-Western College Publishing, Ohio.

Matsui, T., Kakuyama, T., & Onglatco, M. U. (1987). Effects of goals and feedback on performance in groups. *Journal of applied psychology*, *72*(3), 407-415.

Matsui, T., Okada, A., & Inoshita, O. (1983). Mechanism of feedback affecting task performance. *Organizational Behavior and Human Performance*, *31*(1), 114-122.

Mikulka, P. J., Scerbo, M. W., & Freeman, F. G. (2002). Effects of a biocybernetic system on vigilance performance. *Human Factors*, *44*(4), 654-664.

Miller, J. S. (2003). High tech and high performance: Managing appraisal in the information age. *Journal of Labor Research*, *24*(3), 409-424.

Murphy, K. R. (2020). Performance evaluation will not die, but it should. *Human Resource Management Journal*, *30*(1), 13-31.

Murphy, K., Cleveland, J., et Hanscom, M. (2018). *Performance Appraisal and Management*. SAGE Publications.

Narasimhan, A., Jordan, J., Huang, S.H. (2018). *Performance development at GE: Shaping a fit-for-purpose performance management system (A)*. IMD no. IMD-7-1985. Lausanne, VD : International Institute for Management Development.

Nisen, M. (2015). How Millennials Forced GE to Scrap Performance Reviews. Retrieved from : https://www.theatlantic.com/politics/archive/2015/08/how-millennials-forced-ge-to-scrap-performance-reviews/432585/

Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2011). Fundamentals of Human Resource Management. N. York: The McGxraw-Hill/Irwin Companies.

Norris, D. (2015). Millennials : The newest, biggest and most diverse target market. *Environmental Analytics*.

OECD. (2016). *The state of the North American labour market : report prepared for the 2016 North American leaders summit*. Retrieved from : https://www.oecd.org/canada/The-state-of-the-north-american-labour-market-june-2016.pdf

op den Akker, H. J., Klaassen, R., & Nijholt, A. (2016). Virtual coaches for healthy lifestyle. In *Toward Robotic Socially Believable Behaving Systems-Volume II* (pp. 121-149). Springer, Cham.

Palaiologos, A, Papazekos, P., & Panayotopoulou, L. (2011). Organizational justice and employee satisfaction in performance appraisal. *Journal of European Industrial Training, 35(8),* 826-840.

Pichler, S. (2012). The social context of performance appraisal and appraisal reactions: A meta-analysis. *Human Resource Management, 51*(5), 709-732.

Pichler, S. (2019). *Performance appraisal reactions : A review and research agenda* (Steelman, L.A., & Williams, J.R. Ed.). Cham : ZG. Springer.

Pichler, S., Beenen, G., & Wood, S. (2018). Feedback frequency and appraisal reactions: a meta-analytic test of moderators. *The International Journal of Human Resource Management*, 1-26.

Pope, A. T., Bogart, E. H., & Bartolome, D. S. (1995). Biocybernetic system evaluates indices of operator engagement in automated task. *Biological psychology*, *40*(1-2), 187-195.

Powers, W. T. (1973). *Behavior: The control of perception*. Chicago: Aldine.

Proctor, J., & Galicia-Almanza, P. (2017). What are Some Best Practices in Assessing Employee Performance Without Using Performance Reviews?.

Pulakos, E. D., & O'Leary, R. S. (2011). Why is performance management broken?. *Industrial and Organizational Psychology, 4*(2), 146-164.

Pulakos, E. D., Kantrowitz, T., & Schneider, B. (2019). What leads to organizational agility: It's not what you think. *Consulting Psychology Journal: Practice and Research*, *71*(4), 305.

Ravid, D. M., Tomczak, D. L., White, J. C., & Behrend, T. S. (2020). EPM 20/20: A Review, Framework, and Research Agenda for Electronic Performance Monitoring. *Journal of Management*, *46*(1), 100-126.

Ray, W. S. (1955). Complex tasks for use in human problem-solving research. *Psychological Bulletin*, *52*(2), 134-149.

Reeves, M., & Deimler, M. (2011). Adaptability: The New Competitive Advantage. *Harvard Business Review*, *89*(7/8), 134–141.

Roberson, Q. M., & Stewart, M. M. (2006). Understanding the motivational effects of procedural and informational justice in feedback processes. *British journal of Psychology*, *97*(3), 281-298.

Roberts, G. E. (2003). Employee performance appraisal system participation: A technique that works. *Public personnel management*, *32*(1), 89-98.

Rock, D., Davis, J., & Jones, B. (2014). *Kill your performance ratings*. Strategy+ Business.

Rousseau, V., Savoie, A., & Battistelli, A. (2007). *Chapitre 6. La gestion de la performance des équipes de travail*. Gestion des performances au travail, 251-294.

Samuel, M. O., & Chipunza, C. (2009). Employee retention and turnover: Using motivational variables as a panacea. *African journal of business management*, *3* (9), 410-415.

Scharinger, C., Soutschek, A., Schubert, T., & Gerjets, P. (2017). Comparison of the working memory load in n-back and working memory span tasks by means of EEG frequency band power and P300 amplitude. *Frontiers in human neuroscience*, *11*, 6.

Schleicher, D. J., Baumann, H. M., Sullivan, D. W., Levy, P. E., Hargrove, D. C., & Barros-Rivera, B. A. (2018). Putting the system into performance management systems: A review and agenda for performance management research. *Journal of Management*, *44*(6), 2209-2245.

Selvarajan, T. T., & Cloninger, P. A. (2012). Can performance appraisals motivate employees to improve performance? A Mexican study. *The International Journal of Human Resource Management*, *23*(15), 3063-3084.

Shanmugam, S., & Garg, L. (2015). Model employee appraisal system with artificial intelligence capabilities. *Journal of Cases on Information Technology*, *17*(3), 30-40.

Shelton, K. (2001). The effects of employee development programs on job satisfaction and employee retention.

Sherafati, N., Largani, F. M., & Amini, S. (2020). Exploring the effect of computer-mediated teacher feedback on the writing achievement of Iranian EFL learners: Does motivation count?. *Education and Information Technologies*, 1-23.

Smither, J. W., & London, M. (Eds.). (2009). *Performance management: Putting research into action* (Vol. 21). John Wiley & Sons.

Stanton, J. M. 2000. Reactions to employee performance monitoring: Framework, review, and research directions. *Human Performance*, *13*, 85-113.

Stone, D. L., Deadrick, D. L., Lukaszewski, K. M., & Johnson, R. (2015). The influence of technology on the future of human resource management. *Human resource management review*, *25*(2), 216-231.

Summers, L. (2001). Web technologies for administering multisource feedback programs. *The handbook of multisource feedback*, 165-180.

Thite, M. (Ed.). (2018). *E-HRM: Digital approaches, directions & applications*. Routledge.

Tomczak, D. L., Lanzo, L. A., & Aguinis, H. (2018). Evidence-based recommendations for employee performance monitoring. *Business Horizons*, *61*(2), 251-259.

Tziner, A., & Murphy, K. R. (1999). Additional evidence of attitudinal influences in performance appraisal. *Journal of Business and Psychology*, *13*(3), 407-419.

Tziner, A., Joanis, C., & Murphy, K. R. (2000). A comparison of three methods of performance appraisal with regard to goal properties, goal perception, and ratee satisfaction. *Group & Organization Management*, *25*(2), 175-190.

Urbina, S. (2014). *Essentials of psychological testing*. John Wiley & Sons.

Utts, J. M., & Heckard, R. F. (2011). *Mind on statistics*. Cengage Learning.

van Giesen, R. I., Fischer, A. R., Van Dijk, H., & Van Trijp, H. C. (2015). Affect and cognition in attitude formation toward familiar and unfamiliar attitude objects. *PloS one*, *10*(10), e0141790

van Woerkom, M., & Meyers, M. C. (2015). My strengths count! Effects of a strengths-based psychological climate on positive affect and job performance. *Human Resource Management*, *54*(1), 81-103.

Vasset, F., Marnburg, E., & Furunes, T. (2010). Employees' perceptions of justice in performance appraisals. *Nursing Management*, *17*(2), 30-34.

Venables, L., & Fairclough, S. H. (2009). The influence of performance feedback on goal-setting and mental effort regulation. *Motivation and Emotion*, *33*(1), 63-74.

Vijayakumar, B., Höhn, S., & Schommer, C. (2018, December). Quizbot: Exploring formative feedback with conversational interfaces. In *International Conference on Technology Enhanced Assessment* (pp. 102-120). Springer, Cham.

Ward, P. (2011). Goal setting and performance feedback. In *Behavioral sport psychology* (pp. 99-112). Springer, New York, NY.

Wiles, J. (2019). *The real impact on employees of removing performance ratings*. Gartner. Retrieved from : https://www.gartner.com/smarterwithgartner/corporate-hr-removing-performance-ratings-is-unlikely-to-improve-performance/

Wilkie, D. (2015). Is the annual performance review dead ? *Society for Human Resource Management.*

Willyerd, K. (2015). Millennials want to be coached at work. *Harvard Business Review Digital Articles*, 2-5.

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: a meta-analysis of educational feedback research. *Frontiers in Psychology*, *10*, 3087.

Zarei, A. A., & Hashemipour, M. (2015). The effect of computer-assisted language instruction on improving EFL learners' autonomy and motivation. *Journal of Applied Linguistics*, *1*(1), 40-58.

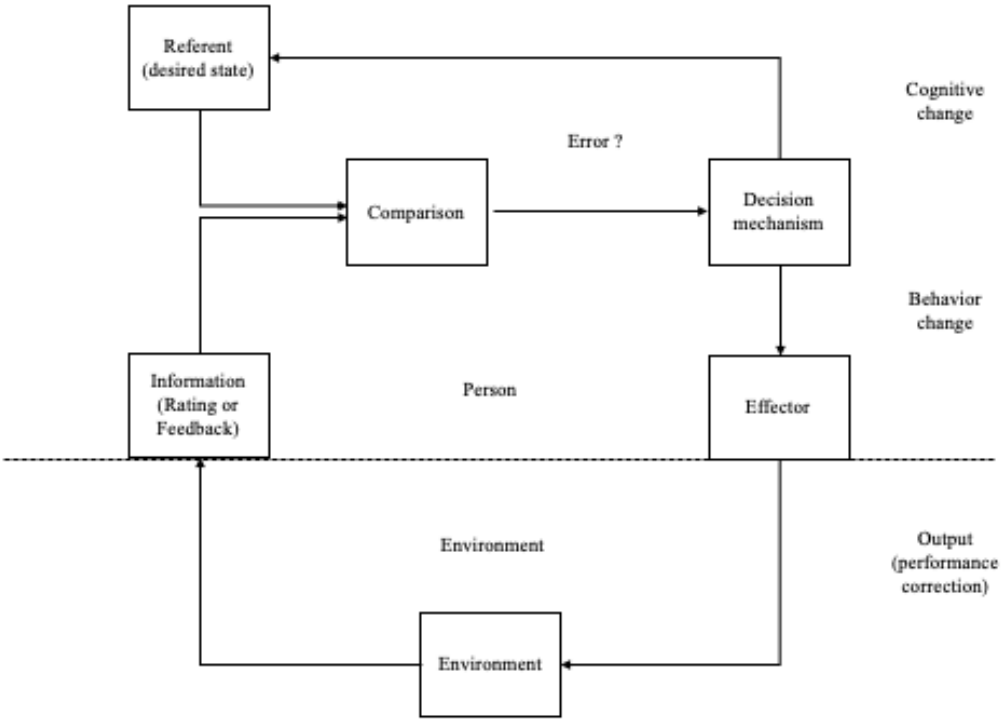
Zeng, M. (2016). What Alternative Performance Appraisal Methods Have Companies Used to Replace Forced Rankings?.

Zhang, W. (2019). Characteristics of Working Memory in Patients with Borderline Personality Disorder. *Investigación Clínica*, *60*(6), 1786-1790.

Appendix A : Methodological Appendix

Appendix A.0.: Theoretical Framework

Model 1. Control systems model of motivation, adapted from Powers, 1973 and Campion and Lord 1982.



Appendix A.1. : Experimental Design

Illustration 1. *Block design*

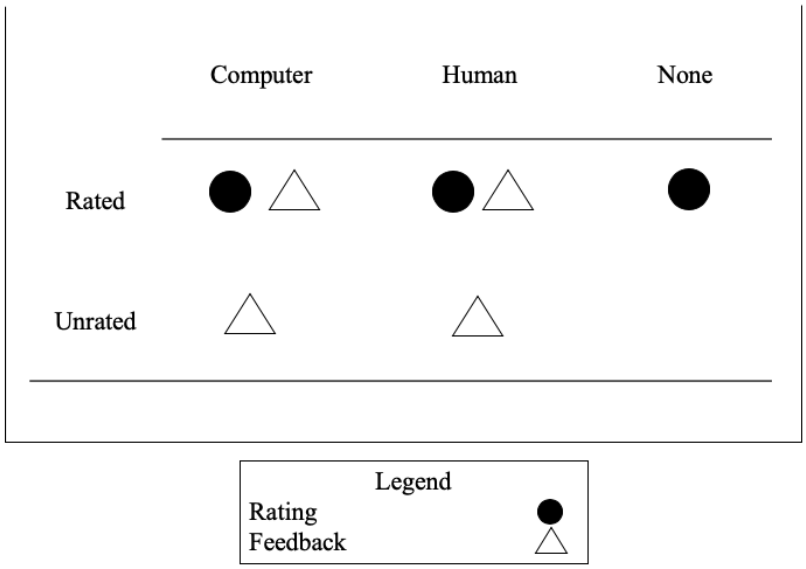
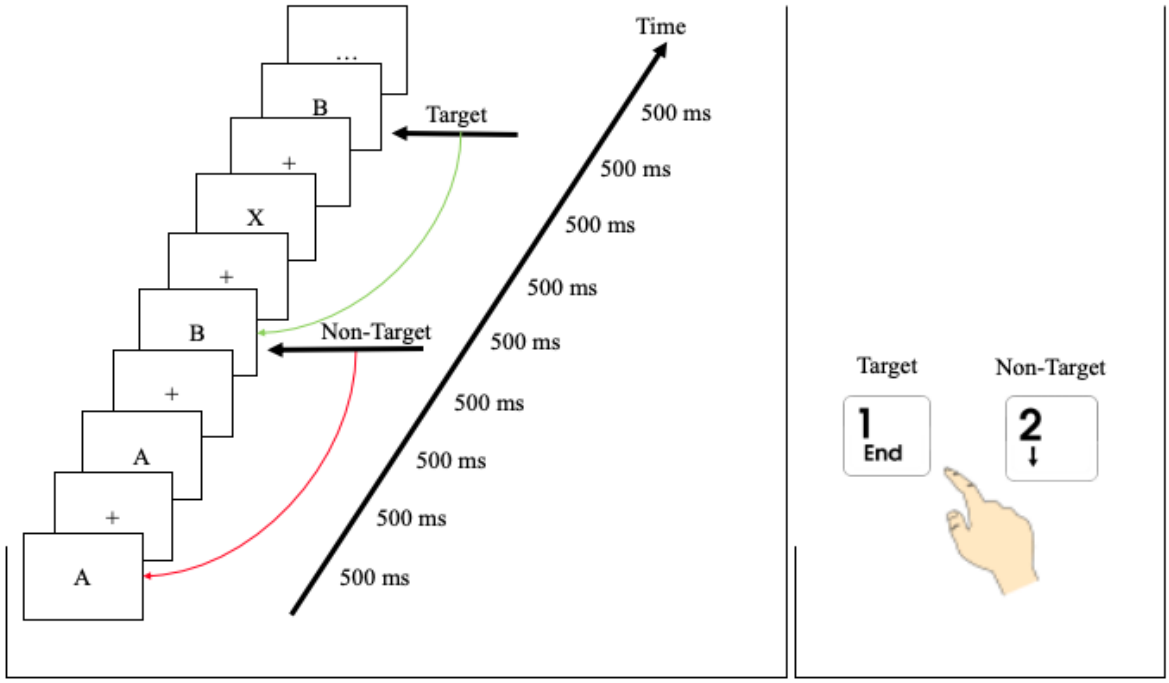


Illustration 2. *Experimental task*



Appendix A.2. : Feedback Script Sample

Sample 1. *Feedback Script Sample*

” Your performance on the block is not perfect at the moment. However, the good news is that there is room for improvement. The n-back task is not an easy cognitive task and it may be confusing at times.”
“Here is some advice to help you out ! Take five deep breaths and rest your eyes for 30 seconds. You will be able to pay more attention to the next task.
“If you get 2 or 3 more trials correct on the next block you will surely have a major improvement !”

N.B. The feedback script is based on Carpentier and Mageau’s (2013) and Mouratidis’s (2010) paper. Here were the following criteria we used to construct the feedback scripts :

1.Being empathetic : ”We understand that your performance is not optimal at the moment. However, the good news is that there is room for improvement. Please remember that the n-back task is not an easy cognitive task, it may be confusing at times”

2.Paired with choices or solutions : “Here is some advice ! (a) Take a deep breath, rest your eyes for 30 seconds and clear your thoughts. (b) You can increase your score by paying close attention to the stimuli that match together. (c) It is best to rote memorize the sequence. *Also takes into account step 4.

3.Based on clear and attainable objectives : “You can definitely increase your performance in the next block ! If you do better on 5 more sequences you will have had a major improvement !”

4.Avoiding person related statements : *There are no statements that personally attack the participant.

5.Pairing the feedback with tips on how to improve future performance : (see recommendation 2).

6.Being delivered promptly : Feedback will be delivered after every block

7.Being delivered privately : Feedback is only delivered to the participant through his screen (Computer) and in a soundproofed room where the participant is alone (Human).

8.In a considerate tone of voice: Feedback is written in the most professional manner.

Appendix A.3. : Psychometric Scales

Scale 1. *Motivation to Improve scale* (Fedor, 1989).

Item	α
1. The feedback makes me want to do better	
2. The feedback encourages me to improve my performance	
3. This feedback increases my commitment to do well	.87

Scale 2. *Adapted Motivation to Improve scale* (Fedor, 1989).

Item	**α**
1. The rating makes me want to do better	
2. The rating encourages me to improve my performance	
3. This Rating increases my commitment to do well	.87

Appendix A.4. : Statistical Assumption Testing

Analysis 1 : "A 2 x 3 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and three within subject factors of feedback source (computer, human, and none) was used to examine the effects of the independent variables performance ratings and feedback source on the dependent variable, performance scores". Seven statistical assumptions need to be met to conduct the present statistical test and to be able to draw inferences from the analysis:

Assumption 1. The dependent variable must be continuous (i.e. interval or ratio). Performance scores are a ratio variable.

Assumption 2. Within-Subjects factors must be related groups. The presence of continuous feedback and it's variability in terms of Feedback Source was common to all participants.

Assumption 3. Between-Subjects factors must be independent groups. The Rated and Unrated groups were independent of one another.

Assumption 4. Outliers mustn't be part of the sample. Two outliers were eliminated from the sample on the basis that their performance scores were outside of a $Z > \pm 3$ range.

Assumption 5. The distribution of the dependent variable must be normal. Performance scores were normally after eliminating the outliers.

Assumption 6. Homogeneity of variance must be respected. Levene's test was not significant, $F_{Computer}$ (1:34) = 1.42, p = .24, F_{Human} (1:34) = .80, p = 37, F_{None} (1:34) = .46, p = .50, therefore, homogeneity of variance is respected.

Assumption 7. Data must be spherical. Mauchly's test of sphericity was not significant, $\chi^2(2) = 1.015$, p = .60, thus the data was spherical.

Analysis 2 :. “A One-way repeated measures analysis of variance (ANOVA) with three within subject factors of feedback source (computer, human, and none) was used to examine the effects of the independent variables performance ratings and feedback source on the dependent variable, motivation to improve performance (after receiving a rating). Five statistical assumptions need to be met to conduct the present statistical test and to be able to draw inferences from the analysis:

Assumption 1. The dependent variable must be continuous (i.e. interval or ratio). Motivation scores are an interval variable.

Assumption 2. Within-Subjects factors must be related groups. Motivation to Improve was measured for the groups that received ratings prior to being exposed the different feedback sources.

Assumption 3. The sample has no outliers. Outliers were not part of this sample.

Assumption4. The distribution of the dependent variables scores must be normal. The distribution of Motivation to Improve scores were normal.

Assumption 5. Data must be spherical. Mauchly’s test of sphericity was not statistically significant, $\chi^2(2) = 1.78$, $p = .41$, thus the data was spherical.

Analysis 3 :. "A 2 x 3 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and three within subject factors of feedback source (computer, human, and none) was used to examine the effects of the independent variables Performance Ratings and Feedback Source on the dependent variable, Motivation to Improve". Seven statistical assumptions need to be met to conduct the present statistical test and to be able to draw inferences from the analysis:

Assumption 1. The dependent variable must be continuous (i.e. interval or ratio). motivation to improve scores are an interval variable.

Assumption 2. Within-Subjects factors must be related groups. Motivation to Improve was measured for the groups that received feedback from a computer, human and when they did not receive any at all.

Assumption 3. Between-Subjects factors must be independent groups. The Rated and Unrated groups were independent of one another.

Assumption 4. The sample has no outliers. Outliers were not part of this sample

Assumption 5. The distribution of the dependent variables scores must be normal. The distribution of Motivation to Improve scores were normal.

Assumption 6. Homogeneity of variance must be respected. Levene's test was not significant, $F_{Computer}$ (1:34) = .52 , p = .47, F_{Human} (1:34) = 25, p = 61, therefore, homogeneity of variance is respected.

Assumption 7. Data must be spherical. Mauchly's test of sphericity does not apply in this case given that there are only two within-subjects' conditions.

Analysis 4 :. “A 2 x 3 mixed factorial analysis of variance (ANOVA) with one between subjects factor of rating (rated and unrated participants) and three within subject factors of feedback source (computer, human, and none) was used to examine the effects of the independent variables performance ratings and feedback source on the dependent variable, task engagement”. Seven statistical assumptions need to be met to conduct the present statistical test and to be able to draw inferences from the analysis:

Assumption 1. The dependent variable must be continuous (i.e. interval or ratio). Engagement scores are an interval variable.

Assumption 2. Within-Subjects factors must be related groups. Engagement was measured for the groups that received feedback from a computer, human and when they did not receive any at all.

Assumption 3. Between-Subjects factors must be independent groups. The Rated and Unrated groups were independent of one another.

Assumption 4. The sample has no outliers. Outliers were not part of this sample as they were eliminated.

Assumption 5. The distribution of the dependent variables scores must be normal. The distribution of Motivation to Improve scores were normal.

Assumption 6. Homogeneity of variance must be respected. Levene’s test was significant, $F_{Computer}$ (1:31) = .52 , p = .61, F_{Human} (1:31) = 001, p = .97, and F_{None} (1:31) = .56 , p = .46 therefore, homogeneity of variance is respected.

Assumption 7. Assumption 7. Data must be spherical. Mauchly’s test of sphericity was not significant, $\chi^2(2) = 3.827$, p = .15, thus the data was spherical.

Appendix B : Figures and Tables

Appendix B.1. Figures

Figure 1. *Differences in performance scores in rated and unrated participants in the different feedback source conditions.*

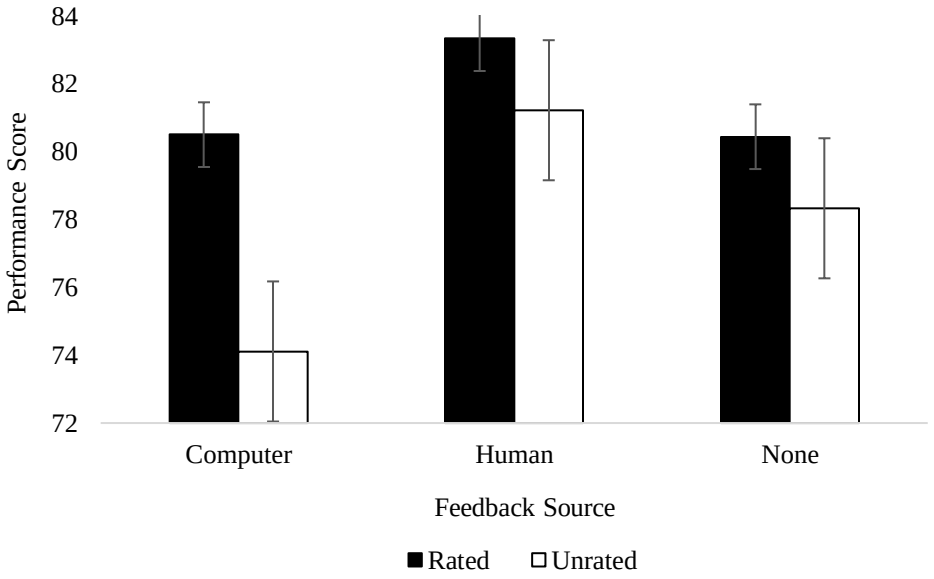


Figure 2. *Differences in performance scores depending on feedback source.*

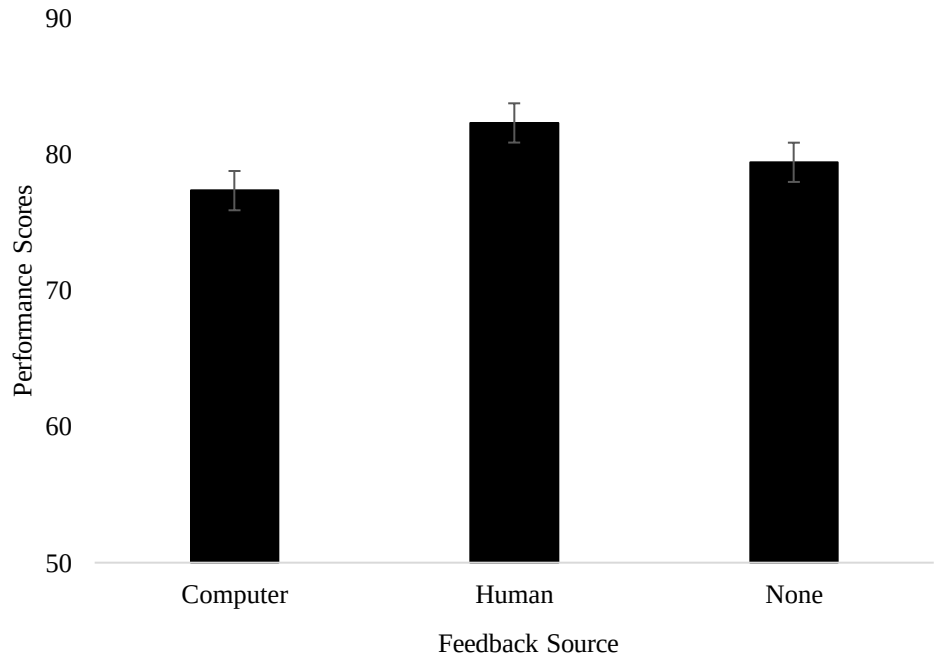


Figure 3. *Differences in performance scores depending on ratings.*

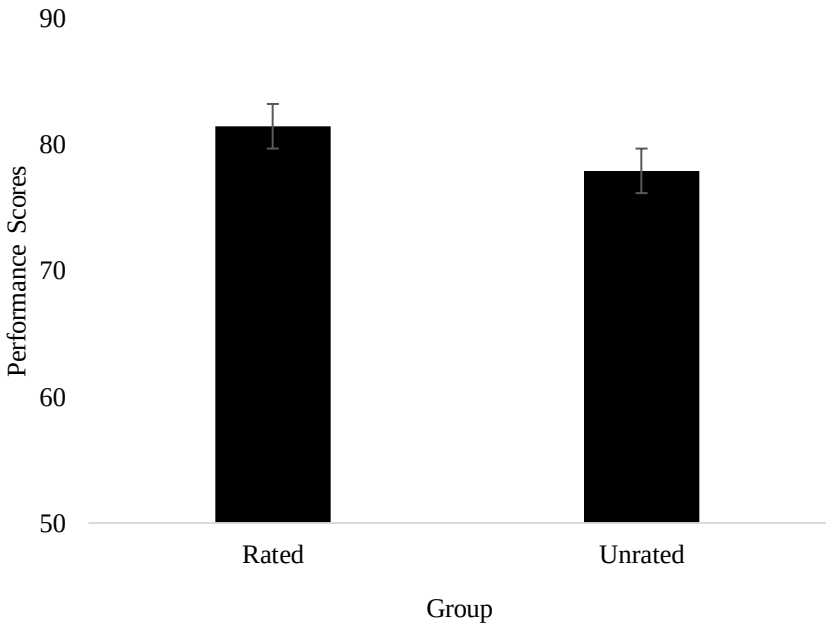


Figure 4. *Main effect of feedback source on Motivation to Improve Performance following ratings*.

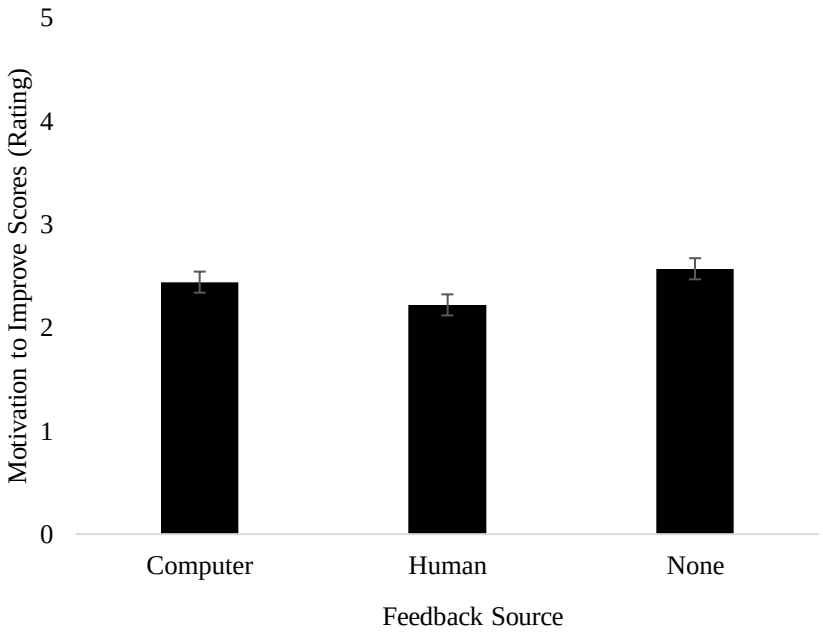


Figure 5.*Differences in Motivation to Improve scores in Rated and Unrated participants in the different Feedback Source conditions.*

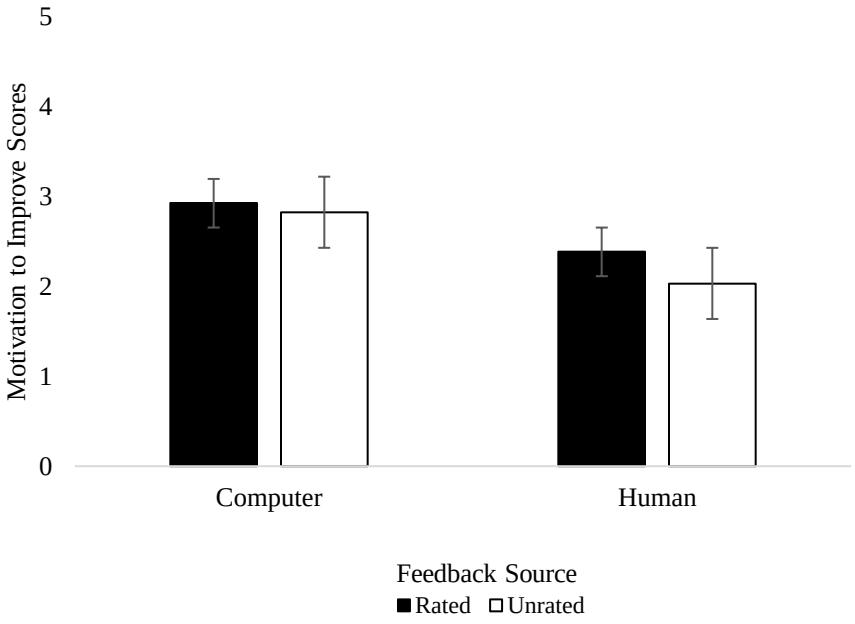


Figure 6. *Main effect of feedback source on the Motivation to Improve scores.*

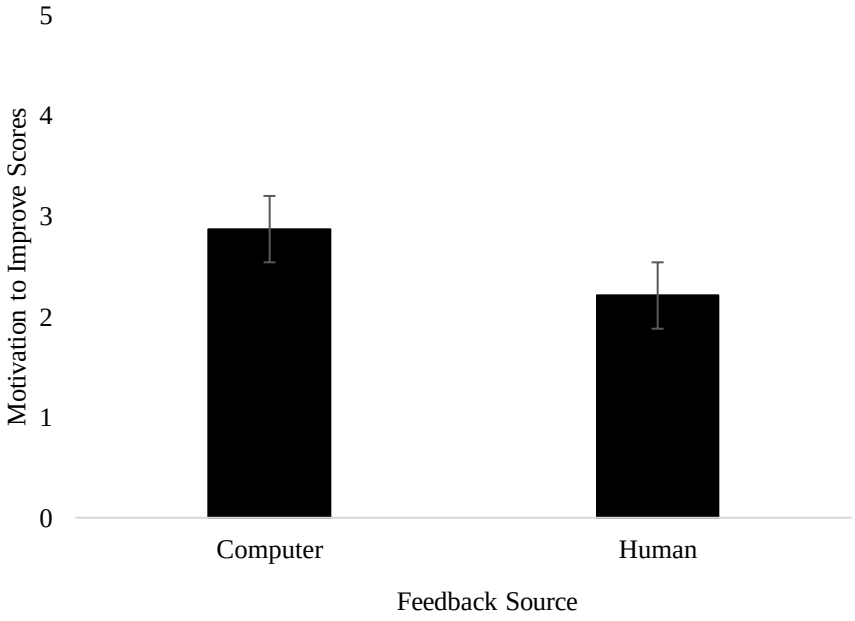


Figure 7. *Main effect of feedback source on the Motivation to Improve.*

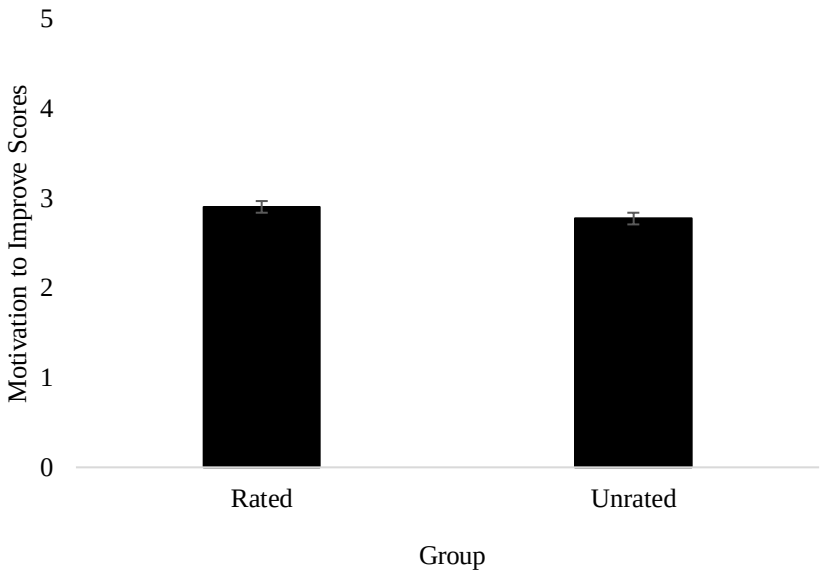


Figure 8. *Differences in Engagement scores in Rated and Unrated participants in the different Feedback Source conditions.*

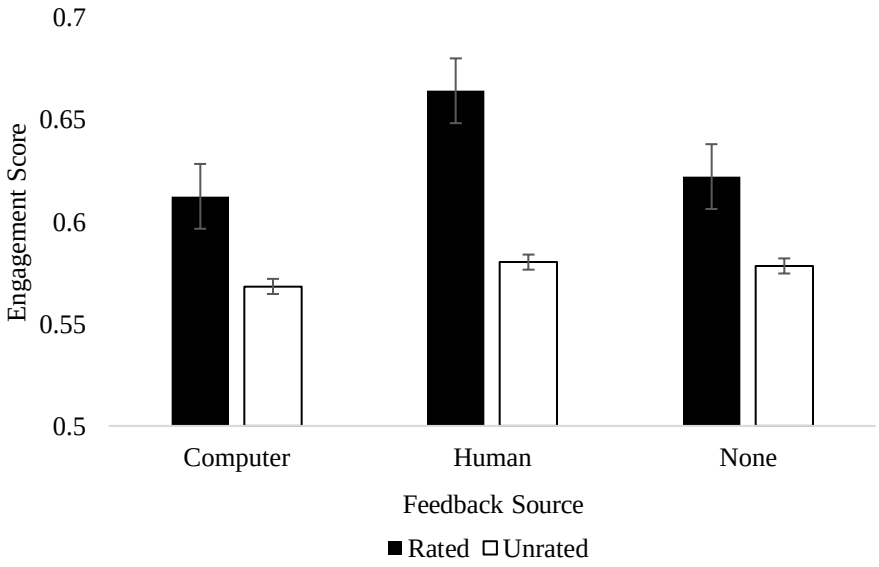


Figure 9. *Differences in Engagement scores depending on Feedback Source.*

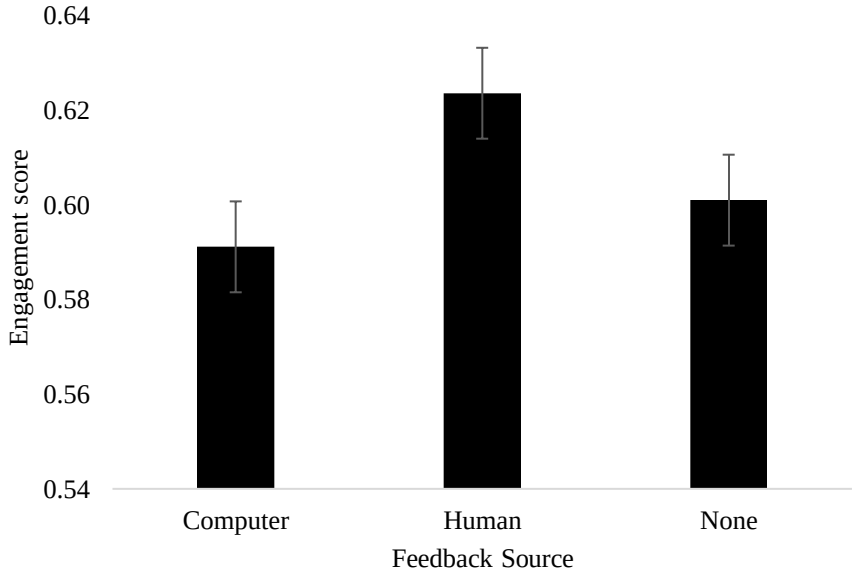
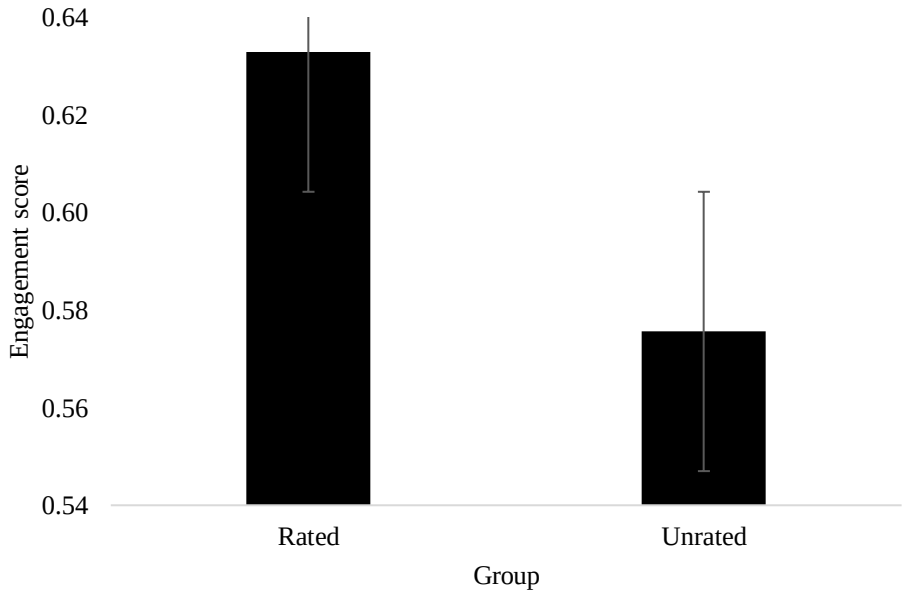


Figure 10. *Differences in Engagement scores depending on Ratings.*



Appendix B.2: Tables

Table 1. *Differences in performance scores in Rated and Unrated participants performance scores*

	Performance Scores	
	M	*SD*
Rated	81.43	4.84
Unrated	77.89	5.59
Overall	79.66	5.46

Note. An independent samples t-test with equal variances assumed was conducted.

Table 2. *Differences in performance scores depending on the Feedback Source*

	Performance Scores	
	M	*SD*
Computer	77.31	8.32
Human	82.28	6.88
None	79.39	5.43
Overall	79.66	6.88

Table 3. *Performance scores depending on Ratings and Feedback Source.*

	Performance Scores			
	Rated		Unrated	
	M	*SD*	*M*	*SD*
Computer	80.50	6.68	74.11	8.74
Human	83.33	6.69	81.22	7.36
None	80.44	5.37	78.33	6.05
Overall	81.42	6.24	77.87	7.38

Table 4. *Inferential Statistics: 2 x 3 Repeated Measures Mixed Factorial Analysis of Variance (ANOVA) Source Table: Differences in Rated and Unrated Participants and Feedback Source on Performance Scores.*

	SS	MS	*F(2, 68)*	p^2	η_p^2
Within					
Feedback Source	448.91	224.45	7.637	<.01*	.18
Feedback Source * Rating	109.80	54.90	1.868	.16	.05
Error	1998.63	29.40			
Between					
Rating	337.80	337.80	4.115	.05*	.11
Error	2791.20	82.09			
Totals	5686.34	728.64			

Note. This is the ANOVA source table of the 2x3 mixed factorial ANOVA.

Table 5. *Mean differences used to calculate pairwise comparisons for performance scores*

	Performance Scores			
	Rated		Unrated	
	M	*SD*	*M*	*SD*
Computer	80.50	6.68	74.11	8.74
Human	83.33	6.69	81.22	7.36
None	80.44	5.37	78.33	6.05

Table 6 : Pairwise comparisons between Rated and Unrated participants and their performance depending on the Feedback Source they received.

Group	Feedback_Source (I)	Feedback_Source (J)	Mean Differences (I-J)	*S.E*	*p*
Rated	Computer	Human	-2.83	1.30	.13
		None	.060	1.62	1.0
	Human	Computer	2.83	1.30	.13
		None	2.89	1.73	.35
	None	Computer	-.060	1.62	1.0
		Human	-2.89	1.73	.35
Unrated	Computer	Human	-7.10*	2.44	.03*
		None	-4.20	1.81	.09
	Human	Computer	7.10*	2.44	.03*
		None	2.90	1.72	.34
	None	Computer	4.20	1.81	1.0
		Human	-2.90	1.72	.34

Table 7. *Motivation to Improve scores following a rating.*

	Motivation to Improve scores following a rating	
	M	*SD*
Computer	2.44	.87
Human	2.22	.86
None	2.57	.65
Rated	2.41	.79

Table 8. *Source Table: One-way Repeated Measures Analysis of Variance (ANOVA). Differences in Rated participants Motivation to Improve scores following a rating.*

	SS	MS	*F(1, 17)*	p^2	η_p^2
Within					
Motivation to Improve (Rating)	1.14	.57	2.21	.13	.12
Error	8.79	.25			
Totals	9.93	.82			

Note. This is the ANOVA source table of the one-way repeated measures ANOVA.

Table 9. *Differences in Motivation to Improve scores in Rated and Unrated participants*

	Motivation to Improve scores	
	M	*SD*
Rated	2.90	.68
Unrated	2.77	.74
Overall	2.84	.71

Table 10. *Differences in Motivation to Improve scores depending on the Feedback Source*

	Motivation to Improve scores	
	M	*SD*
Computer	2.87	.95
Human	2.21	.96
None	3.41	.97
Overall	2.81	.96

Table 11. *Pairwise comparisons of the main effect of Feedback Source on the Motivation to Improve.*

		Motivation to Improve scores			
		M	*SD*	Mean difference	*p*
Computer	Computer	2.87	.95		
	Human	2.21	.96	.67	<.01*

Table 12. *Motivation to Improve scores depending on Ratings and Feedback Source.*

	Motivation to Improve scores			
	Rated		Unrated	
	M	*SD*	*M*	*SD*
Computer	2.92	.94	2.83	.98
Human	2.38	.91	2.03	1.00
Overall	2.89	.91	2.43	.99

Table 13. *Source Table: 2 x 3 Repeated Measures Mixed Factorial Analysis of Variance (ANOVA). Differences in Rated and Unrated Participants and Feedback Source on Motivation to Improve scores.*

	SS	MS	*F(2, 68)*	p^2	η_p^2
Within					
Motivation to Improve (Feedback)	8.00	8.00	20.19	<.01*	.37
Motivation to Improve (Feedback) * Rating	.30	.30	.76	.38	.02
Error	13.47	.39			
Between					
Rating	.89	.89	.61	.44	.02
Error	49.62	1.46			
Totals	60.51	11.04			

Note. This is the ANOVA source table of the 2x3 mixed factorial ANOVA.

Table 14. *Differences in Engagement scores in Rated and Unrated Participants*

	Engagement scores	
	M	*SD*
Rated	.63	.19
Unrated	.58	.22
Overall	.60	.21

Table 15. *Differences in Engagement scores depending on Feedback Source*

	Engagement scores	
	M	*SD*
Computer	.59	.20
Human	.62	.22
None	.60	.21
Overall	.60	.21

Table 16. *Engagement scores depending on Ratings and Feedback Source.*

	Engagement scores			
	Rated		Unrated	
	M	*SD*	*M*	*SD*
Computer	.61	.19	.57	.22
Human	.66	.21	.58	.22
None	.62	.19	.58	.24
Overall	.63	.20	.58	.23

Table 17. *Source Table: 2 x 3 Mixed Analysis of Variance (ANOVA). Differences in Rated and Unrated Participants and Feedback Source on Engagement scores.*

	SS	MS	*F(2, 62)*	p^2	η_p^2
Within					
Engagement (from each feedback source)	.02	8.00	4.028	.02	.12
Engagement* Rating	.01	.30	2.025	.14	.06
Error	.14	.002			
Between					
Rating	.08	.81	.61	.43	.02
Error	4.074	.13			
Totals	4.324	9.242			

Note. This is the source table of the 2x3 Repeated measures ANOVA.