Computers in Human Behavior Reports 8 (2022) 100227

Contents lists available at ScienceDirect

Computers in Human Behavior Reports

journal homepage: www.sciencedirect.com/journal/computers-in-human-behavior-reports

The impact of electronic monitoring on employees' job satisfaction, stress, performance, and counterproductive work behavior: A meta-analysis

Rudolf Siegel *, Cornelius J. König, Veronika Lazar

Saarland University, Germany

ARTICLE INFO

Keywords:
Electronic monitoring
Job satisfaction
Stress
Performance
Employees
Counterproductive work behavior

ABSTRACT

Organizations all around the world increasingly use electronic monitoring to collect information on employees' working behavior. To investigate the effects of electronic monitoring on employees' job satisfaction, stress, performance, and counterproductive work behavior (CWB), we collected data of 70 independent samples and 233 effect sizes for this meta-analysis. Results indicate that electronic monitoring slightly decreases job satisfaction, $r = -0.10$, and slightly increases stress, $r = .11$, supporting the notion that electronic monitoring negatively affects employees' well-being and work attitudes. Moderator analyses suggest that performance targets and feedback may further exacerbate these negative effects on workers. Furthermore, maintaining and improving the performance of employees is an important justification of electronic monitoring. However, the current meta-analysis found no relationship between electronic monitoring and performance, $r = -0.01$, but a small positive relationship with CWB, $r = 0.09$. These results question the benefits of electronic monitoring for organizations. Thus, decision-makers in organizations should pay attention to what ends employees are monitored. Beyond that, the current meta-analysis shows that laboratory studies probably underestimate the relationship between monitoring and employees' job satisfaction, stress, and performance in field studies. In addition, current research on the effects of electronic monitoring lacks the examination of processes why organizations implement electronic monitoring and how electronic monitoring and work design are related to each other.

1. Introduction

Electronic monitoring of employees is a strongly debated topic since the 1980s (e.g., Irving, et al., 1986; Tamuz, 1987). What is more, advances in technology led over the years to cheaper, more efficient, and easier to implement monitoring systems that resulted in higher numbers of electronically monitored employees (Alge & Hansen, 2013; Ravid et al., 2019). For example, in algorithmic management an algorithm distributes tasks, regulates work processes, and controls performance. This management style is more and more widespread in technology corporations and cannot work without collecting data on employees' behavior (Galière, 2020; Möhlmann & Zalmanson, 2017). This way, monitoring is present in a greater intensity and extent than previously seen.

Whereas proponents of electronic monitoring stress advantages like fair performance evaluation, improved security of employees, and higher accountability, opponents emphasize disadvantages like reduced employees' well-being (Ball, 2010; Ravid et al., 2019; Sewell & Barker, 2006; Yost et al., 2018). Research on electronic monitoring reflects these different stances: Some studies find detrimental effects not only on employees (Ball & Margulis, 2011; Cascio & Montealegre, 2016; Ravid et al., 2019; Stanton, 2000; Yost et al., 2018), but also on supervisors and organizations (Reilly, 2010; Yost et al., 2018); according to other studies, electronic monitoring increases well-being, performance, and job satisfaction, especially if used in a developmental and supporting manner (Ravid et al., 2019; Wells et al., 2007). The increasing use and intensity as well as these different effects of electronic monitoring make a quantitative and systematic research synthesis desirable.

So far, there have been two systematic meta-analyses on electronic monitoring and its impact on employees (Backhaus, 2019; Carroll, 2008) and both have major limitations. Whereas the meta-analysis by Carroll (2008) was only concerned with feedback interventions, the meta-analysis by Backhaus (2019) did not investigate moderators except for study design. Thus, the current meta-analysis updates previous meta-analyses and extends them by investigating moderator variables. For example, the influence of study setting, performance targets, and

* Corresponding author. Work and Organizational Psychology, Saarland University, Campus A1.3, D-66123, Saarbrücken, Germany
E-mail address: rudolf.siegel@uni-saarland.de (R. Siegel).

https://doi.org/10.1016/j.chbr.2022.100227
Received 23 May 2021; Received in revised form 15 July 2022; Accepted 28 July 2022
Available online 12 August 2022

feedback on the effects of electronic monitoring is investigated.

2. Background

2.1. Definition and use of electronic monitoring

One of the first studies on electronic monitoring defined it "as the use of electronic instruments or devices such as audio, video, and computer systems to collect, store, analyze, and report individual or group actions or performance" (Nebeker & Tatum, 1993, p. 509). Though technical advances have tremendously changed the methods how employees can be monitored (Cascio & Montealegre, 2016; Khakurel et al., 2018) since Nebeker and Tatum's (1993) study, the purpose and target have not changed: employees' performance and behavior are monitored to maintain organizations' performance, prevent theft and legal liabilities, and foster security or development of employees (Ball, 2010; Ravid et al., 2019). With the emergence of the internet, the misuse of organizations' information technology for non-work related activities by employees got more and more prevalent (cyberloafing, Mercado et al., 2017). Electronic monitoring offered a possibility to check employees' behavior on the internet and to block the access to certain web pages. Beyond that, it can also be used to control the time that is spent with different software on an organization's computer. The use of electronic monitoring to diminish cyberloafing has lost importance in recent days due to the development of smartphones (Mercado et al., 2017). With these devices, employees are able to cyberloaf at the workplace without using an organization's information technology. In line with these reasons, previous research discussed monitoring either as a stress inducing factor for employees, a possibility to ensure security and performance of employees by organizations or to protect an organization's legitimate interests (Sewell & Barker, 2006).

The latest representative survey on the use of electronic monitoring is from the American Management Association (2007) and estimates that about half of the surveyed companies in the USA are electronically monitoring their employees. Since then, the use of ubiquitous computing has proliferated. Ubiquitous computing describes the application of computing devices in any form and location. Examples are wearables and IoT (internet of things) devices. Wearables are small devices worn by individuals that are capable of collecting a large amount of data about their wearer (see also Khakurel et al., 2018). IoT describes a concept to connect a vast number of devices sharing the data of their sensors. Furthermore, advances in big data analysis, and reduced costs has further increased the use of monitoring systems (Cascio & Montealegre, 2016; Ghislieri et al., 2018; Schwarzmüller et al., 2018). Compared to traditional human monitoring, electronic monitoring offers the possibility to continuously and unobtrusively collect and store data on employees' behavior (Ravid et al., 2019). For example, modern workforce management systems can analyze vast amounts of data to identify how much time employees spent in meetings or on the phone and which employees are influential to others (e.g., Microsoft, 2019).

2.2. Effects of electronic monitoring on employees

Previous studies addressed the impact of electronic monitoring on an array of dependent variables like work satisfaction, perceived stress, privacy violation, performance, perceived autonomy, trust, social support, and alike (Alge & Hansen, 2013; Backhaus, 2019; Ravid et al., 2019; Stanton, 2000). Thus, it is possible to examine a huge number of effects which electronic monitoring may have on employees. At this point, we focus our efforts on job satisfaction, stress, performance, and counterproductive work behavior (CWB) because there are numerous studies that took these variables into account, whereas other variables were less often addressed (Backhaus, 2019). In addition, these other possible dependent variables show a substantial correlation with our main outcomes. For example, a meta-analysis found high relationships between job satisfaction, justice/fairness perceptions, and citizenship behaviors (Fassina et al., 2008). In addition, the four chosen variables show distinct characteristics. Job satisfaction can show the impact of electronic monitoring on employees' work attitudes and stress can show the impact on employees' well-being. Beyond that, maintaining performance is an important justification for the implementation of electronic monitoring. CWB is another relevant variable that plays an important role in the relationship between employees and their employer.

2.2.1. Job satisfaction and stress

There are different justifications to monitor employees electronically. Ball (2010) states three different reasons: maintaining productivity and resources of an organization, protection of corporate interests and secrets, and protection from legal liabilities. Some researchers extend this list of purposes by monitoring techniques which target employees' security and development (Ravid et al., 2019; Sewell & Barker, 2006). For example, a location sensing device can be used to track employees during their work time, but can also solely be used to locate employees after an accident. Taking these different purposes and their frequency into account (see, American Management Association, 2007; Deutscher Gewerkschaftsbund, 2016; Holland et al., 2015, for older data on monitoring use), most monitoring implementations target employees' behavior to ensure productivity and corporate interests. These organizational interests might not be completely in line with employees' interests (Frey, 1993). This way, electronic monitoring might not only affect employees' performance but also the perception of job satisfaction and stress.

Job satisfaction describes the contentedness of an individual with their job or certain facets of their job (Neuberger et al., 1978). There are different theoretical justifications why electronic monitoring may affect employees' job satisfaction. For example, Holman et al. (2002) argues from a stress stance that the intensity of monitoring will reduce job satisfaction due to higher perceived work pressure. Others propose a relationship with work design (Parker, 2014): Working procedures that have less variety and complexity are more easily to observe and monitor but reduce employees' autonomy (Carayon, 1994; Gagné & Bhave, 2011; Martin et al., 2016). This in turn reduces job satisfaction. Empirically, several studies found a negative relationship of electronic monitoring with job satisfaction (cf., Alge & Hansen, 2013; Backhaus, 2019; Ravid et al., 2019). Based on these theoretical arguments and empirical findings, we propose the following hypotheses:

Hypothesis 1. There is a negative relationship between electronic monitoring and employees' job satisfaction.

Similar to the negative influence of electronic monitoring on job satisfaction, a detrimental impact of electronic monitoring on employees' stress can be assumed. According to Karasek (1979), perceived stress can be characterized by heightened arousal caused by work demands and demands resulting from other life domains. If this energy cannot be released due to low autonomy it manifests into strain and harms the individual in the long-term. Again, if monitoring reduces the autonomy of employees and emphasizes performance measures, it will probably increase stress. This relationship has been found empirically (cf., Alge & Hansen, 2013; Backhaus, 2019; Ravid et al., 2019). Thus, we propose the following hypothesis:

Hypothesis 2. There is a positive relationship between electronic monitoring and employees' perceived stress.

2.2.2. Performance

A key justification for the use of electronic monitoring is the observation and maintenance of organizational performance and thus employees' performance. Accordingly, performance monitoring is a key part in performance management (Armstrong, 2006; DeNisi & Murphy, 2017) and of managerial behavior (Komaki, 1986; Yukl, 2012). Different theories are able to explain the effect of monitoring on performance, but

agency theory is the most prominent one (Eisenhardt, 1989; Sewell & Barker, 2006) and predicts that monitoring employees results in higher performance than not (Mahaney & Lederer, 2011). Based on a contract, agency theory proposes that a principal (more specifically the employer) hires an agent (more specifically the employee) to execute certain tasks in return of a salary. Since it is not possible to specify every detail of work execution, the agent has some room for discretion in the way the work is carried out (Sewell & Barker, 2006). Due to the agent's self-interest, the agent tries to minimize the necessary amount of work while not endangering the salary what could result in loafing. Monitoring decreases the agent's advance in knowledge over the principal and allows the principal to react to the performance of the agent. Research has indeed found a positive impact of electronic monitoring on performance (e.g., Backhaus, 2019). We follow this finding and propose a positive relationship between these two variables:

Hypothesis 3. There is a positive relationship between electronic monitoring and employees' performance.

Even though the main purpose of electronic monitoring is maintaining and increasing work performance, we would like to point out that there is also contradicting evidence in this regard. Following a stress perspective, electronic monitoring can be seen as a hindrance which might result in an energized state and higher performance in the short term (e.g., Karasek, 1979). However, without proper resources to cope with electronic monitoring, performance will probably degrade (e.g., Bakker et al., 2005; Karasek, 1979). Frey (1993) pointed also out that the interpretation of monitoring within agency theory is an oversimplification. Due to signaled mistrust by electronic monitoring, employees might react with decreased work effort to the implementation of an electronic monitoring system. In addition, there are also studies that do not find a positive relationship between monitoring and performance (e.g., Aiello & Kolb, 1995; Becker & Marique, 2014). However, maintaining performance is still the most prominent justification for electronic monitoring and the most recent meta-analysis found a positive relationship of electronic monitoring with performance (Backhaus, 2019). Accordingly, we think that Hypothesis 3 is still well justified.

2.2.3. Counterproductive work behavior

CWB describes voluntarily behavior that violates organizational norms and targets (Bennett & Robinson, 2000). Working less than possible or agreed on, wasting the resources of an organization, or humiliating coworkers or supervisors are examples of deviant behavior within an organizational context. In addition to maintaining performance, electronic monitoring aims at detecting CWB and aligning employees' to organizational goals (e.g., Ball, 2010). Thus, electronic monitoring should result in reduced CWB. Indeed, previous research found a diminishing effect of electronic monitoring on CWB (Martin et al. (2016); Yost, 2018). However, based on an equity hypothesis, one can assume that electronic monitoring increases CWB. If employees perceive monitoring as a violation in their employee-employer relationship and see it as a sign of distrust, they may want to rebuild equity in the relationship and mistreat their organization as well. Based on this argumentation, it is possible that electronic monitoring fosters and accordingly, some studies found this link empirically (de Vries & van Gelder, 2015; Hu et al., 2016). Due to unclear expected relationship between electronic monitoring and CWB, we refrain from proposing a hypothesis. Instead, we formulate a research question to guide the analysis without proposing a certain direction of an effect:

Research Question 1. Is electronic monitoring positively or negatively related to CWB?

2.3. Moderator analysis

In addition to these main effects, there are plausible moderators that may alter the relationship of monitoring with the outcome variables. As Ravid et al. (2019) pointed out, monitoring "is not a psychological construct but a method" (Ravid et al., 2019, p. 102) and its effects may thus differ according to its characteristics. One of these characteristics is the purpose that is communicated to employees why they are monitored. So far, the most attention in monitoring research gained performance maintenance and employee development (DelVecchio et al., 2013; Ravid et al., 2019; Wells et al., 2007). Whereas performance maintenance is in line with organizational interests, employee development is in line with employees' interests. For example, monitoring the number of pieces of blue-collar workers might have the reason to maintain employees' performance by the management, but could also solely provide feedback to employees. The influence of purpose on the relationship of monitoring with job satisfaction and stress can be explained using attributional theories (e.g., Nishii et al., 2008). If employees perceive electronic monitoring in their interests, the impact of monitoring on stress and job satisfaction should be less severe than they perceive monitoring only in organizational interests. Thus, we propose the following hypotheses:

Hypothesis 4. There is a stronger negative relationship between electronic monitoring and job satisfaction if monitoring is done in organizational interests rather than in employees' interests.

Hypothesis 5. There is a stronger positive relationship between electronic monitoring and stress if monitoring is done in organizational interests rather than in employees' interests.

In an organizational setting, performance targets are a common method of performance management (Armstrong, 2006; DeNisi & Murphy, 2017). More specifically, individual employees or a team of employees are requested to meet a certain performance target within a given time. To encourage the achievement of these targets, employers may offer incentives for meeting performance targets. In contrast, employees may be threatened by dismissal or developmental training for repeated failure to meet these goals. This way, individual goals and organizational goals can be aligned (Eisenhardt, 1989). Nebeker and Tatum (1993) and Gosnell et al. (2020) found evidence for the relevance of performance targets in monitoring research. For example, Gosnell et al. (2020) found that airline captains reduced especially their fuel consumption when they had to reduce the consumption to a certain limit. Despite this positive impact on productivity, Nebeker and Tatum (1993) argue that performance targets put employees under pressure to fulfill these targets and employees might perceive failed performance targets as a defeat. In terms of stress theories, performance targets probably increase the number of work demands (e.g., work pressure) without providing further resources (e.g., Bakker et al., 2005; Karasek, 1979). Thus, performance targets probably increase stress and reduce job satisfaction. Accordingly, we propose the following hypotheses:

Hypothesis 6. There is a stronger negative relationship of electronic monitoring with job satisfaction if monitoring is used together with performance targets rather than without performance targets.

Hypothesis 7. There is a stronger positive relationship of electronic monitoring with stress if monitoring is used together with performance targets rather than without performance targets.

2.3.1. Study setting as a moderator

A long-debated topic in social sciences is the generalizability of results in laboratory studies to real world settings (e.g., Mitchell, 2012). This issue is prevalent in the field of electronic monitoring research as well (Ravid et al., 2019). For example, Becker and Marique (2014) asked undergraduates to put wooden pegs in a box for 5 min. Whether the results of this study can be applied to a long-term employment relationship under constant monitored is questionable. However, even field studies in monitoring research were concentrated in call-centers where work is highly standardized and monitored (Ravid et al., 2019). To conclude, it is possible that laboratory studies report different effect

sizes than field studies due to short-term effects and missing relevance for the future working conditions. At the contrary, several meta-analyses suggest that laboratory studies are comparable to field studies especially in work and organizational psychology and if workplace characteristics are examined (Mitchell, 2012; Vanhove & Harms, 2015). Thus, there is conflicting evidence regarding the generalizability of laboratory studies to field settings. We propose the following research question without any assumption of the direction of an effect:

Research Question 2. Do laboratory studies and field studies differ in the magnitude of their effect size?

3. Method

Hypotheses, variables, information about data collection, and analyses were registered prior to conducting this study. In addition, this paper was written as a reproducible manuscript using R (see Aust & Barth, 2018). All files to reproduce statistical analysis and reports of statistics will be publicly available. The preregistration and the analysis files are available at the Open Science Framework (https://osf.io/q57v8). The preregistration states more moderation hypotheses than reported in this study, but we could not investigate these hypotheses as too few studies differ in these moderators. At first, we conducted the meta-analysis only for the dependent variables job satisfaction, stress, and performance (as preregistered). One of our reviewers made us aware that CWB is another interesting variable that might behave differently than the other three investigated variables and electronic monitoring is designed to detect CWB. Thus, we added CWB as an additional variable to analyze. In addition, the previously presented moderators are likely to influence the relationship between monitoring and performance (e.g., a performance target is likely to also increase performance). However, electronic monitoring research predominantly discusses these moderators in relation to job satisfaction and stress. Due to this circumstance, we missed preregistering hypotheses regarding moderations for the performance outcome. To address this issue, we analyzed all moderators for all dependent variables, if possible.

3.1. Literature search

To identify published articles, we conducted an extensive literature search using several databases and sources. Similar to Backhaus (2019), the used databases were related to business psychology because this field has the most studies that were related to electronic monitoring and its implications on employees. After preregistering our study, we noticed that some studies were also published in the area of computer science and economics which did not appear in the databases that were related to business psychology. Thus, we extended our literature search to incorporate specifically databases from the field of computer science and economics. In addition, we extended it further to cover also Phd thesis. We did not limit the search results to a certain range of the year of publication.

We gathered articles from the Web of Science database and the EBSCO Information Services and included the following databases in the search on EBSCO Information Services: Academic Search Complete, APA PsycArticles, APA PsycInfo, Psyndex, ERIC, EconLit, OpenDissertations, and Business Source Premier. In addition, we included results from ACM Digital Library, IEEExplore, and AISeLibrary. We used, combinations and alterations of words related to work and electronic monitoring as search terms (see Table 1 for more details). However, search terms varied slightly between the databases due to different features (see the supplemental material on the Open Science Framework for the corresponding search terms to each database). We conducted the search on February, 3rd and 4th, 2021. We updated our collection of found articles on April 6th, 2022 to cover articles that were published since February 3rd, 2021.

Initially, we gathered 9617 studies. After removing duplicates (8867 studies remained), we applied our inclusion and exclusion criteria (see below) first to titles and then to abstracts (210 studies remained). After that, we looked through the references of the remaining studies and identified articles that did not appear in our database search and applied the inclusion and exclusion criteria to them (backward search, Field & Gillett, 2010). Additionally, we collected articles which did not appear in our database search but cited articles identified by our database search and applied the inclusion and exclusion criteria to them (forward search, Field & Gillett, 2010). The proceedings of the Society for Industrial and Organizational Psychology (SIOP) conferences were also checked for articles that were relevant for the current meta-analysis. In addition, we reached out to researchers who published more than two articles in the field to ask for overlooked or unpublished studies. Overall, we asked 47 researchers and got replies from 16 researchers. After these steps, we excluded 26 studies because they were a review, 73 studies which did not manipulate or measure electronic monitoring, 39 studies that did not measure our outcome variables, 12 studies which did not report necessary data and authors did not provide them, 3 studies because they examined electronic monitoring from a law or engineering perspective, 16 studies because their data were already reported elsewhere, 13 studies which used a qualitative approach, 15 studies that were not accessible and authors did not provide access, 6 studies which had a theoretical perspective on electronic monitoring. Finally, 63 studies were eligible for full text assessment. Figure 1 depicts found, included, and excluded studies.

Table 1
Used search terms to gather articles from databases.

work	electronic	monitoring
job	performance	surveillance
employ	computer	observation
occupation	smartphone	
	smartwatch	
	tablet	
	wearables	
	iot	

Note. Terms in columns were linked with "or" operators, terms between columns were linked with "and" operators. See supplemental material on the Open Science Framework for more information.

3.2. Inclusion and exclusion criteria

To be included in our current meta-analysis, studies had to meet the following criteria: They (a) had to be an empirical study, (b) must be written in English or German language, (c) had to implement electronically or computer-based monitoring in a working context, and (d) had to contain at least one of the relevant dependent variables (job satisfaction, stress, performance and/or CWB). In addition, studies had to be full-text accessible. Studies were excluded if they were a literature review, merely stated ethical or moral perspectives, monitoring was realized by direct/personal monitoring without electronic tools, or none of the relevant dependent variables were present (see also Fig. 1). When preregistering the current study, we were not aware of the number of studies that are concerned with electronic monitoring of hand hygiene in a clinical context (e.g., Iversen et al., 2020). Although these studies fitted the inclusion criteria, we excluded them because hand hygiene is a single, well-defined behavior compared to a working behavior that consists of multiple facets.

3.3. Final data set and coding of studies

All studies that were deemed eligible for full text assessment were assessed by two coders (inter-rater reliability = 94.4%). All coders used the same coding table, which ensured an identical coding procedure. Beforehand, coders made clear that they understood all coding variables and there is a common ground of coding variables. If the studies did not

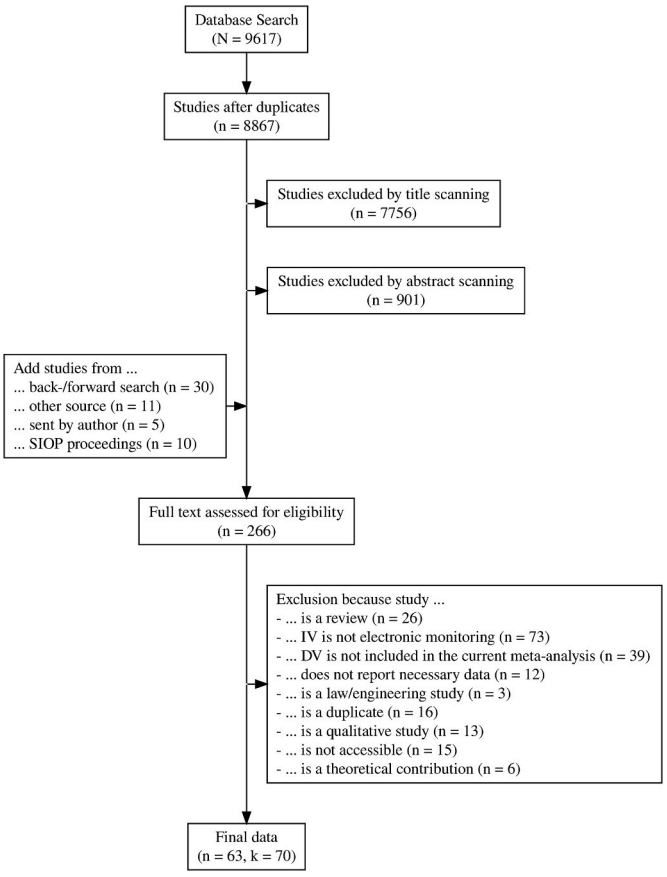

Fig. 1. Flowchart showing the process of identifying and selecting studies
Note: DV = dependent variable; IV = independent variable; SIOP = Society for Industrial and Organizational Psychology.

report necessary details, we reached to the authors to obtain them. In five cases it was not possible to obtain standard deviations for reported means. We imputed these standard deviations using a similar approach to Kwon and Reis (2015). We predicted the missing standard deviations by a Bayesian generalized linear model (assuming a Gamma-distribution of the standard deviations) from the corresponding means (R^2 = .46, 95% CI [.31, .62]). Due to the low number of missing values and for the sake of easier reporting, we refrain from reporting results of a multiple imputation instead reporting results of a single imputation. However, results did not substantially change on subsequent runs of the imputation model or with multiple imputation.

To be included, studies had to manipulate the presence of electronic monitoring (experimental design), compare groups/organizations with and without monitoring (quasi-experimental design), or report a self-report of an electronic monitoring measure (correlative design). In the case of a correlative design, we excluded studies which did not measure electronic monitoring but constructs like perceived privacy invasion (e.g., Yost et al., 2018), satisfaction with performance monitoring (e.g., McNall & Stanton, 2009), and certain characteristics like monitoring purpose (e.g., DelVecchio et al., 2013). Beyond that, studies had to report one of our four dependent variables: job satisfaction, stress, performance, and CWB. Job satisfaction was always a self-reported measure and included similar constructs like task satisfaction (e.g., Nebeker & Tatum, 1993) or facets like intrinsic/extrinsic job satisfaction (e.g., Holman et al., 2002). Stress was most of the time a self-report measure and included constructs like burnout (e.g., Adams & Mastracci, 2019), exhaustion (e.g., Castanheira & Chambel, 2010), and cynicism (e.g., Castanheira & Chambel, 2010). We included also psycho-physiological measures like pulse rate if this was used as a measure of stress (e.g., Henderson et al., 1998). Studies measured performance most of time experimentally measured (like speed or corrected entries; e.g., Bartels & Nordstrom (2012) or provided by ratings of call-center agents (e.g., Story & Castanheira, 2020). CWB was always a measure reported by the employees themselves or from their coworkers and included constructs like cyberloafing (e.g., Luo et al., 2022) and deviance (Thiel et al., 2021).

In addition to the independent and dependent variables, we coded also potential moderators. Monitoring purpose included a developmental purpose (study participants perceived monitoring as beneficial for the employee), a performance maintenance purpose (participants perceived monitoring as beneficial for the organization), and no purpose (study participants received no explanation for the monitoring procedure). We also coded whether studies were conducted in a laboratory setting or a field setting. In almost all cases, laboratory studies had an experimental design and field studies had a quasi-experimental or correlative design. However, there were three exceptions: Galinsky et al. (1995), Gosnell et al. (2020), and Nebeker and Tatum (1993) conducted an experimental study in a field setting. We treated these three studies as field studies. The moderator goal setting reflected whether participants in a study had to reach a certain performance target.

At this stage, we dropped studies if they did not meet the inclusion criteria or met exclusion criteria. The final data set consisted of 63 studies with 70 independent samples, and a total of 233 effect sizes. Overall, each independent sample included M = 3.33 (SD = 3.31, Median = 2) effect sizes for M = 1.33 (SD = 0.56, Median = 1) dependent variables.

3.4. Data analysis

All analyses were conducted in R (Version 4.1.2, R Core Team, 2015) using the *metafor* package (Version 3.4.0, Viechtbauer, 2010). To convert various effect sizes to the Pearson correlation coefficient, we used the *esc* package (Version 0.5.1, Lüdecke, 2019). We combined effect sizes using the Fisher Z-transformation and transformed them back to report effect sizes on the raw correlation scale.

Several coded studies in our meta-analysis did provide several estimates for the same dependent variable (job satisfaction, stress, performance, and CWB) or even for multiple dependent variables (see Huston et al., 1993, for example). To take these dependencies between effect sizes coming from the same study into account, we estimated a random-effects model with multiple dependent variables (Viechtbauer, 2010). This allowed us to analyze all studies and all dependent variables within a single analysis. More specifically, we extended the regular random effects model (that has two levels) to a three-level model in which effect sizes were nested in dependent variables which in turn where nested in independent samples. Therefore, we estimated for each dependent variable in each independent sample a true effect. This way, we were able to estimate the variance of the effect sizes which originates from differences between studies (Viechtbauer, 2010). For this purpose, we report τ, an estimator for the standard deviation of the true effects between studies. τ does not differentiate between random or systematic sources of variance. Accordingly, moderators can be used to explain systematic differences between studies and reduce τ. To depict this influence, we report how much variance (in percent) a moderator can explain in between-study variance. For every moderator, a single meta-regression model was estimated.

However, dependencies between effect sizes make it necessary to know the covariance between dependent variables within studies (Kalaian & Raudenbush, 1996). Unfortunately, these covariances are often not available, like in our case (Van den Noortgate et al., 2012). To circumvent this issue, we applied two distinct approaches. First, we examined the correlations between job satisfaction, stress, performance, and CWB on *metaBUS* (date of query: March 24th, 2021; Bosco et al. (2019). metaBus is a research synthesis platform to conduct rudimentary, instant meta-analysis on a large set of collected research articles (see also https://metabus.org/). Job satisfaction (metaBUS ID: 20072)

correlated with stress (metaBUS ID: 20432) to $r = -.29$, with performance (metaBUS ID: 40055) to $r = .19$, and with CWB (metaBUS ID: 20188) to $r = -.19$. Stress correlated with performance to $r = .01$, and with CWB to $r = .27$. Performance correlated with CWB to $r = -.11$. We used this information to construct the missing covariances between effect sizes within the same independent sample. For effect sizes of the same dependent variable, we assumed a correlation of $r = .50$ (see Scammacca et al., 2014). We assumed no correlation between effect sizes of different samples. The construction of this variance-covariance matrix helps in taking account the dependencies between effect sizes in the meta-analytical model. Finally, we used a cluster robust estimation of the variance-covariance matrix to report confidence intervals (Viechtbauer, 2010). Cluster robust estimation is another method to take dependencies between effect sizes into account, if the exact dependence of effect sizes is not known (the correlation between them is unknown) and the number of studies is small (see also Tipton & Pustejovsky, 2015). Please note that the reported results did not differ substantially from results without constructed covariance matrix and without a robust estimation.

4. Results

4.1. Descriptive statistics of studies and samples

All included studies and their description are shown in Appendix A. On average the samples had an age of $M = 28.58$ ($SD = 9.56$) years and were to $M = 62.6$ ($SD = 23.1$) percent female. The studies were conducted in the United States ($n = 40$), the United Kingdom ($n = 4$), Australia ($n = 4$), Germany ($n = 3$), Canada ($n = 2$), Iceland ($n = 1$), Turkey ($n = 1$), South Africa ($n = 1$), Pakistan ($n = 1$), New Zealand ($n = 1$), and China ($n = 3$). Half of the studies were conducted in or before 2009. The oldest included study was from 1986, and the latest from 2022.

4.2. Main results

Hypothesis 1 stated a negative relationship between electronic monitoring and job satisfaction. Indeed, we found a reliable negative relationship between these two variables, $r = -.10$, 95% CI [− .16, −.04]. Hypothesis 2 proposed a positive relationship of electronic monitoring with stress which we found as well, $r = .11$, 95% CI [.05, .17]. Thus, we were able to find evidence in support of Hypotheses 1 and 2 and show a detrimental influence of electronic monitoring on employees. However, we did not find the positive relationship of monitoring with performance as stated in Hypothesis 3, $r = -.01$, 95% CI [−.06, .03]. Research Question 1 was concerned with the relationship between electronic monitoring and CWB. We found a positive relationship between electronic monitoring and CWB, $r = .09$, 95% CI [.02, .16]. Main meta-analytical results are shown in Table 2. A forest plot of the main analysis is available in the online supplemental material.

4.3. Effects of moderators

Hypothesis 4 stated that monitoring has a stronger negative relationship with job satisfaction if monitoring emphasizes organizational interests than employees' interests. There were too few studies to examine the impact of developmental purposes, but we were able to contrast organizational interests against no given purposes. If participants received no explanation for the purpose of the monitoring system, the relationship of electronic monitoring with job satisfaction was more negative, $r = -.17$, 95% CI [−.26, −.08], compared to a performance maintenance purpose, $r = -.09$, 95% CI [−.23, .05]. Hypothesis 5 stated that monitoring has a stronger positive relationship with stress in the case of emphasizing organizational interests than employees' interests. Again, there were too few studies to investigate the developmental purpose for this moderator. No given purposes yielded a stronger negative relationship of electronic monitoring with stress, $r = -.06$, 95% CI [−.22, .10], in contrast to a communicated performance maintenance purpose, $r = .07$, 95% CI [−.06, .20]. On an exploratory basis, we also investigated this moderator for performance. Communicating a developmental purpose, electronic monitoring showed no relationship with performance, $r = .00$, 95% CI [−.17, .17], whereas no given purpose showed a slightly positive link to performance, $r = .03$, 95% CI [−.04, .10]. Performance purposes resulted in a slightly negative relationship, $r = -.04$, 95% CI [−.12, .05]. In all cases CIs were large and differences too small to meaningful interpret differences between moderator levels. Therefore, there is no strong support for a differentiation of the different attributions (see Table 3). In the case of CWB, there were too few studies to be able to compare the different moderator levels.

Hypothesis 6 and 7 were concerned with the effect of performance targets on the relationship of monitoring with job satisfaction and stress. In both cases, the existence of performance targets should strengthen the relationship of monitoring with the dependent variable. The existence of performance targets yielded a stable negative relationship between monitoring and job satisfaction, $r = -.25$, 95% CI [−.41, −.08], whereas this was not the case for the absence of performance targets, $r = -.08$, 95% CI [−.25, .10]. Thus, there is evidence in favor of Hypothesis 6. The relationship of monitoring with stress differed not from zero with and without performance targets, $r = .04$, 95% CI [−.17, .25] and $r = -.01$, 95% CI [−.13, .11] respectively. Thus, there was no conclusive evidence in favor of or against Hypothesis 7. On an exploratory basis, we tested this moderator for performance. There was no relationship of monitoring with performance when performance targets were present, $r = -.01$, 95% CI [−.09, .06], or not, $r = -.02$, 95% CI [−.09, .05]. See Table 4 for more information. In the case of CWB, there were too few studies to be able to compare the different moderator levels.

Research Question 2 was concerned with biases of the study setting and whether laboratory and field studies find different results regarding the relationship between electronic monitoring and the dependent variables. Study setting (laboratory vs. field studies) had a differential influence on the dependent variables. We found a reliable negative relationship in field studies between monitoring and job satisfaction, $r = -.13$, 95% CI [−.20, −.06], but not in laboratory studies, $r = -.10$, 95% CI [−.23, .04]. However, confidence intervals did not indicate a strong difference between these to study settings. Laboratory settings found a correlation of $r = .00$, 95% CI [−.11, .10], between monitoring and stress, whereas field studies found a correlation of $r = .16$, 95% CI [.10, .23], between these two variables. In the case of performance,

Table 2
Main meta-analytical results.

				Reliability		Correlation	
Dependent variable	*k*	*e*	*N*	*DV*	*IV*	τ	*r*
Job satisfaction	16	31	3258	.84 (.08)	.93 (.11)	0.14	−.10, [−.16, −.04]
Stress	34	77	8194	.83 (.09)	.93 (.10)	0.18	.11, [.05, .17]
Performance	32	108	9497	.99 (.03)	.98 (.07)	0.10	−.01, [−.06, .03]
CWB	11	17	2815	.86 (.09)	.88 (.10)	0.16	.09, [.02, .16]

Note. Abbreviations: k = number of independent samples; e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies; r = estimated mean true effect and surrounding 95% CI.

Table 3
Meta-analytical results regarding monitoring purpose.

Purpose	k	k_l	e	N	Reliability		r
					DV	*IV*	
Job satisfaction (τ = .15, 0.00%)							
No purpose	4	3	7	368	.80 (.14)	> .99 (.00)	−.17, [−.26, −.08]
Performance	4	2	9	529	.88 (.02)	.94 (.13)	−.09, [−.23, .05]
Stress (τ = .17, 10.56%)							
No purpose	5	4	8	362	.74 (.14)	> .99 (.00)	−.06, [−.22, .10]
Performance	10	8	25	635	.84 (.15)	.97 (.08)	.07, [−.06, .20]
Performance (τ = .10, 1.27%)							
Developmental	2	2	2	585	.99 (.01)	> .99 (.00)	.00, [−.17, .17]
No purpose	10	8	22	697	.99 (.02)	> .99 (.00)	.03, [−.04, .10]
Performance	17	16	57	1508	.99 (.02)	> .99 (.00)	−.04, [−.12, .05]

Note. Abbreviations: k = number of independent samples (k_l: conducted in a laboratory); e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies and how much variance the moderator can explain in between-study variance (in percent); r = estimated mean true effect and surrounding 95% CI.

Table 4
Meta-analytical results regarding performance targets.

Performance target	k	k_l	e	N	Reliability		r
					DV	*IV*	
Job satisfaction (τ = .23, 0.00%)							
No target	5	4	11	412	.83 (.13)	> .99 (.00)	−.08, [−.25, .10]
Target	2	1	6	120	.88 (.02)	> .99 (.00)	−.25, [−.41, −.08]
Stress (τ = .16, 20.14%)							
No target	12	11	25	573	.83 (.15)	> .99 (.00)	−.01, [−.13, .11]
Target	2	1	6	77	.63 (*NA*)	> .99 (.00)	.04, [−.17, .25]
Performance (τ = .11, 0.00%)							
No target	24	21	76	2110	.99 (.02)	> .99 (.00)	−.02, [−.09, .05]
Target	4	2	20	334	.98 (.04)	> .99 (.00)	−.01, [−.09, .06]

Note. Abbreviations: k = number of independent samples (k_l: conducted in a laboratory); e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies and how much variance the moderator can explain in between-study variance (in percent); r = estimated mean true effect and surrounding 95% CI.

laboratory studies did not find a correlation between monitoring and performance, r = −.03, 95% CI [−.09, .04], but field studies found a small relationship, r = .04, 95% CI [−.03, .11]. Therefore, there is small evidence that field studies might find a small positive relationship with performance (see Table 5). Regarding CWB, there was only one study which was conducted in a laboratory setting. We thus skipped the calculation of this moderator level for CWB.

4.4. Exploratory analysis

On an exploratory basis we were able to investigate two further moderators. In the case of performance, we could distinguish quantity and quality. However, there was no difference between these two kinds of performance (quality: r = −.01, 95% CI [−.12, .10], quantity: r = −.01, 95% CI [−.08, .07]; see Table 6). In addition, we examined whether feedback of the monitoring system has an impact on the dependent variables. The relationship between monitoring and job satisfaction was lower in the case of feedback, r = −.31, 95% CI [−.40, −.22], than without feedback, r = −.10, 95% CI [−.25, .06]. Also, the relationship with stress was stronger with feedback, r = .27, 95% CI [.21, .33], than without feedback, r = −.02, 95% CI [−.15, .11]. In the case of performance, studies in which the monitoring system provided

Table 5
Meta-analytical results regarding study setting.

Study setting	k	e	N	Reliability		r
				DV	*IV*	
Job satisfaction (τ = .15, 0.00%)						
Laboratory	5	12	501	.82 (.13)	> .99 (.00)	−.10, [−.23, .04]
Field	11	19	2757	.85 (.04)	.84 (.12)	−.13, [−.20, −.06]
Stress (τ = .17, 11.36%)						
Laboratory	13	32	651	.88 (.12)	> .99 (.00)	.00, [−.11, .10]
Field	21	45	7543	.82 (.08)	.82 (.08)	.16, [.10, .23]
Performance (τ = .11, 0.00%)						
Laboratory	24	81	2080	> .99 (.01)	> .99 (.00)	−.03, [−.09, .04]
Field	8	27	7417	.94 (.05)	.89 (.14)	.04, [−.03, .11]

Note. Abbreviations: k = number of independent samples; e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies and how much variance the moderator can explain in between-study variance (in percent); r = estimated mean true effect and surrounding 95% CI.

Table 6
Meta-analytical results regarding quality vs. quantity.

Performance	k	k_l	e	N	Reliability		r
					DV	*IV*	
Performance (τ = .00, 100.00%)							
Quantity	25	21	67	1835	.99 (.02)	.99 (.03)	−.01, [−.08, .07]
Quality	15	11	38	1583	.98 (.03)	.99 (.03)	−.01, [−.12, .10]

Note. Abbreviations: k = number of independent samples (k_l: conducted in a laboratory); e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies and how much variance the moderator can explain in between-study variance (in percent); r = estimated mean true effect and surrounding 95% CI.

feedback reported a relationship of performance with monitoring, r = .05, 95% CI [−.02, .11]. Without feedback there was no relationship, r = −.02, 95% CI [−.10, .06] (see Table 7). Unfortunately, there were too few studies regarding CWB to conduct a moderator analysis.

4.5. Inspection of meta-analytical biases

To show possible biases in the main meta-analytical results, we

Table 7
Meta-analytical results regarding monitoring feedback.

					Reliability		
Feedback	*k*	k_l	*e*	*N*	*DV*	*IV*	*r*
Job satisfaction (τ = .15, 0.00%)							
No feedback	5	5	12	501	.82 (.13)	> .99 (.00)	−.10, [−.25, .06]
Feedback	2	0	6	361	.88 (.02)	.87 (.18)	−.31, [−.40, −.22]
Stress (τ = .14, 38.85%)							
No feedback	11	11	24	555	.88 (.12)	> .99 (.00)	−.02, [−.15, .11]
Feedback	4	1	10	588	.73 (.14)	.91 (.15)	.27, [.21, .33]
Performance (τ = .11, 0.00%)							
No feedback	21	20	68	1451	> .99 (.01)	> .99 (.00)	−.02, [−.10, .06]
Feedback	6	3	30	993	.98 (.03)	.98 (.05)	.05, [−.02, .11]

Note. Abbreviations: k = number of independent samples (k_l: conducted in a laboratory); e = number of effect sizes; N = mean sample size per study summed over studies; *DV* = dependent variable; *IV* = independent variable; τ = estimated standard deviation of true effects between studies and how much variance the moderator can explain in between-study variance (in percent); r = estimated mean true effect and surrounding 95% CI.

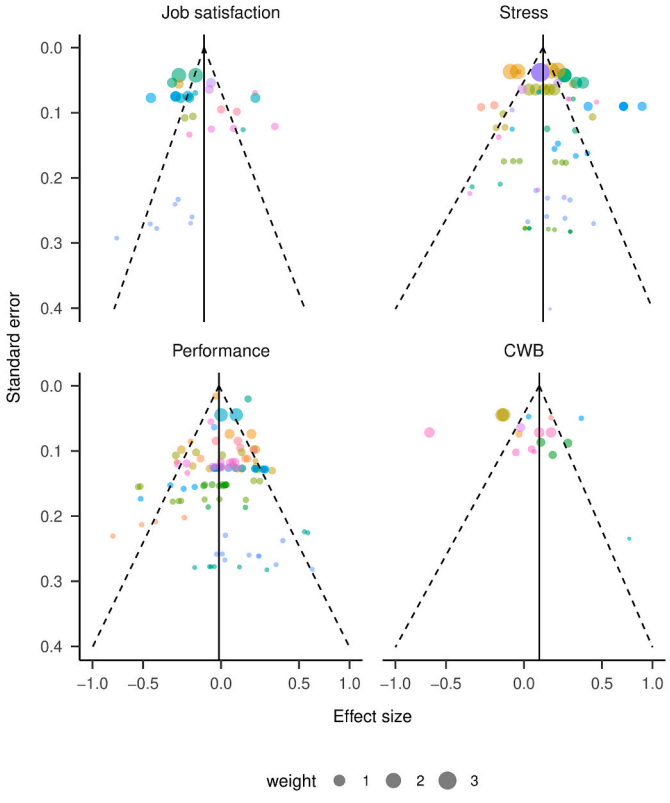

Fig. 2. Funnel plots for job satisfaction, stress, performance, and counterproductive work behavior
Note: Dots indicate a single effect size with its corresponding standard error. Dot size represent the weight (in percent) in the meta-analytical model. Colors indicate independent samples.

created funnel plots for every dependent variable (see Fig. 2). To take the different dependent variables and the dependencies between effect sizes into account, there is a funnel plot for every dependent variable and different colors represent independent samples. The funnel plots do not indicate a strong publication bias in our sample. Independent samples with higher precision (and lower standard error) are close to the estimated overall effect size. Independent samples with lower precision (and higher standard error) are scattered further away from the estimated overall effect size. In the case of job satisfaction, there are two independent samples with effect sizes of low precision which suggest a negative relationship of electronic monitoring with job satisfaction. The counterpart that suggests a positive relationship of monitoring with job satisfaction is missing. Regarding stress, there are more effect sizes with lower precision that indicate a positive relationship of electronic monitoring with stress than the other way round. There are also more low precision effect sizes which suggest a positive relationship between performance and electronic monitoring than a negative relationship. However, all these effect sizes have a low influence on the estimated overall effect size. Regarding CWB, there is one independent sample with higher precision which suggests a strong negative relationship of electronic monitoring with CWB but no counterpart which suggest a positive relationship. It is unlikely that this study biases the current results because it is in the opposite direction of the estimated overall effect size and can only reduce the absolute size of the estimated effect.

In addition to funnel plots, we investigated whether there is an indication of publication bias using the PET-PEESE method (Carter et al., 2019; Stanley & Doucouliagos, 2013). The PET-PEESE method investigates whether there is a bias because of studies with small samples which report large effect sizes. In our case, the slope of the standard error for the relationship between electronic monitoring and dependent effect sizes were all non-significant. Thus, there was no indication that studies with small samples bias the current results.

5. Discussion

Previous meta-analysis examining the impact of electronic monitoring on employees were either concerned with feedback interventions (Carroll, 2008) or did not investigate moderators except for study design (Backhaus, 2019). Thus, this meta-analysis updated existing meta-analysis and examined how further moderators influenced the effect of electronic monitoring on employees. To this end, the current meta-analysis investigated the effect of electronic monitoring on job satisfaction, stress, performance, and CWB while taking monitoring purpose, performance targets, study setting, kind of performance, and monitoring feedback into account. Overall, we found a reliable small negative relationship of electronic monitoring with job satisfaction and a reliable small positive relationship with stress. The current results (a) support previous findings on the relationship of electronic monitoring with job satisfaction and stress (Backhaus, 2019; Ravid et al., 2019), (b) is in line with stress theories and their predictions (Gagné & Bhave, 2011; Karasek, 1979; Martin et al., 2016), and (c) supports the notion that electronic monitoring has a negative impact on employees' well-being (Alge & Hansen, 2013; Ball, 2010; Ravid et al., 2019). On a first glimpse, one might argue that these effect sizes are too small to be practically relevant. However, it should be kept in mind that many employees may experience electronic monitoring over multiple hours per day for many years in their life. The long-term implications of these small effect sizes have probably severe and aversive consequences for employees' life and well-being (see Bosco et al., 2015; Funder and Ozer, 2019; for an in-depth discussion).

An important justification for electronic monitoring is performance monitoring and maintenance (Ball, 2010; Ravid et al., 2019). However, we found no relationship of monitoring with performance and its confidence interval was narrow around zero. Thus, there is most probably no overall effect of electronic monitoring on performance in existing studies. This non-existing effect is in line with stress theories (Karasek,

1979) but in contradiction with agency theory (Eisenhardt, 1989; Mahaney & Lederer, 2011). There might be several reasons for not finding this relationship. Electronic monitoring is most often not solely implemented (cf., Cascio & Montealegre, 2016; Reilly, 2010) but comes with a variety of HR measures like pay-for-performance and certain work design decisions (Gerhart & Fang, 2015; Parker, 2014). Current research not looked into work design decisions that go in line with electronic monitoring and it is thus unknown how they influence each other. This way, it could be possible that there is only a performance benefit by electronic monitoring if it is accompanied by certain HR measures (cf., Posthuma et al., 2018; Stanton & Weiss, 2000). In contradiction with this argument is that we could not find a strong impact of moderators onto the relationship of monitoring with performance. What is more, there are several arguments in the literature why monitoring might have a negative impact on performance and might overshadow positive effects on performance. For example, Stanton and Julian (2002) found that employees focus on monitored aspects of their work and disregard non-monitored aspects. This way, the overall performance might be negatively affected and positive effects canceled out. Reilly (2010) investigated how electronic monitoring affects managers. In their study, supervisors and managers complained about reduced autonomy because they have to achieve certain levels of performance indicators even though this might come with negative side effects. Beyond that, our meta-analysis found a positive relationship between electronic monitoring and CWB. Thus, it is possible that deviance and reduced extra-role helping behavior lowers performance gains. To conclude, there are already different reasons why electronic monitoring might not affect performance as desired. There is a need for further research to investigate whether these reasons have actually an influence on the relationship between monitoring and performance.

The positive relationship between monitoring and CWB support the findings of Frey (1993) that monitoring might be seen as a violation of the employer-employee relationship. This way and in accordance with an equity hypothesis, employees try to rebalance the relationship with their organization and engage in deviant behavior. This result is rather worrisome as electronic monitoring seems to have not only negative implications for employees but also for the organization that is using monitoring. In combination that electronic monitoring does not foster performance, there are probably more disadvantages than advantages for organizations when using electronic monitoring.

Taking moderators into account, there was evidence that monitoring combined with performance targets stronger decreases job satisfaction than without performance targets. This was not the case for stress. Performance targets might increase work demands and reduce autonomy what should result in decreased job satisfaction (Demerouti et al., 2001; Karasek, 1979). Why this is not reflected in the case of stress, needs further investigation. Even though appropriate feedback is often discussed as a positive behavior in organizational settings (e.g., Bakker et al., 2005; Kluger & DeNisi, 1996), electronic monitoring combined with feedback showed a much stronger negative influence on job satisfaction and stress than no feedback. This is the case although some researchers suggest that electronic monitoring can improve feedback by its objective and exact nature (cf., Alder & Ambrose, 2005). It might be the case that employees do not perceive the feedback of an electronic monitoring systems as helpful. Information displayed by a monitoring system might be rather unexciting (like the amount of work that has already be done) and might not help to get new insights in one's working style and to achieve a goal (e.g., in the sense of job crafting, Parker, 2014). Thus, the exact processes between electronic monitoring, feedback, and performance warrant further research. In the case of performance, no tested moderator yielded improved performance under varying moderator levels. This results questions further whether electronic monitoring helps to improve and maintain performance. However, the number of studies regarding certain moderator analysis was rather low. Thus, this should be kept in mind when interpreting the moderator analysis and when drawing implications. The current results regarding the moderator analysis should be seen as tentative and need further investigation.

Overall, laboratory studies seem to underestimate the relationship between monitoring with job satisfaction, stress, and performance. This result can be explained by a number of factors. For example, many laboratory studies lack consequences like increased or reduced salary depending on the monitoring outcome. In addition, laboratory studies miss a meaningful working context. For example, O'Donnell et al. (2013) asked their undergraduate participants to create as many paper aero-planes as possible. Even though this is probably an adequate procedure to test an experimental manipulation in a laboratory setting, it is questionable whether the results of this task done by students is generalizable to a wider population in an organizational setting. The present meta-analysis found similar effects for laboratory studies and field studies even though laboratory seem to underestimate the effect size in field studies to a small degree. Thus, this strengthens the notion that laboratory studies can be used to investigate the effects of monitoring in a controlled environment. However, future research should pay attention to this issue and clarify under which circumstances different study settings come to different conclusions.

5.1. Limitations and research implications

Readers of the current study should keep the following limitations in mind. First, we investigated only four dependent variables. However, job satisfaction can be seen as a proxy for other attitudinal variables like work motivation and commitment. Stress might be a proxy for other variables that reflect employees' well-being. Performance and CWB are both important indicators how monitoring might affect the relationship between employees and their respective organization. Thus, the current study investigated four dependent variables that are crucial in understanding the effects of electronic monitoring. Beyond that, it is also possible to focus more strongly on verification of certain theories. Using meta-analytical structural equation modeling or path modeling (Cheung, 2015), mediation models and more complicated models can be examined to verify the predictions of theories. For example, it could be worthwhile to investigate whether the impact of electronic monitoring on the dependent variables are mediated by job demands and job resources (cf., Bakker et al., 2005). Such a mediation model implies the theoretical assumption that monitoring affects job demands and job resources which in turn affect the dependent variables. However, it is still an open research question whether electronic monitoring can act as a specific work demand (depending on its characteristics) or it shapes work characteristics in a negative way to ease monitoring. In many use cases, monitoring is not solely implemented but goes in line with certain work design decisions.

Second, as with any other meta-analysis, the current findings can only be as good as the primary studies which were included ("garbage in, garbage out"). The sample of the current meta-analysis has certain biases and the results are not generalizable without keeping the following aspects in mind. The included studies are limited in their selection of participants and many studies use undergraduates or clerical workers as participants. In addition, most of the studies were either conducted in call-centers or in a laboratory setting. Therefore, there is a lack of different professional backgrounds in primary studies. Future research should extend their samples to employees who have not been studied yet. For example, electronic monitoring in a context where other humans are dependent on another individual (e.g., healthcare) may provoke other effects than working in an assembly line (see Hayes & Moore, 2017). Beyond that, there seems to be no validated measure to obtain a good indicator of the amount of electronic monitoring. There is a variety of measures and many studies develop their own measure. This questions the reliability and validity of the gathered results (cf., Flake et al., 2017). Future research should pay attention to this problem and develop validated measures for the research area of electronic monitoring which can be used over different studies. However, to mitigate the

issue of strong methodological problems in the primary studies, we included only peer-reviewed studies in our sample.

Third, there are different understudied areas in the context of electronic monitoring. The lion's share of electronic monitoring research is concerned with effects of electronic monitoring on subordinates' job attitudes, well-being, and performance (Alge & Hansen, 2013). However, the effect of electronic monitoring on organizational management and supervisors' behavior and attitudes is largely unknown. Notable exceptions are Aiello and Svec (1993), Oz et al. (1999), Chen and Ross (2005), and Reilly (2010). These studies suggest that even the supervisors' autonomy is reduced because they have to act in ways that foster key performance indicators. Another area which is understudied in electronic monitoring research is the variation of work designs and HR measures. For example, there are no studies that examine which HR measures do accompany monitoring implementations. More specifically, it is unknown how electronic monitoring and pay-for-performance are related to each other and how this relation influences the effect of electronic monitoring on employees. This problem is also prevalent in the case of monitoring consequences (e.g., lay-offs, reduced loan). Thus, a field study that is neglecting the influence of work design might be missing crucial characteristics of monitored work. Even more, there is no research how organizations make the decision to implement a monitoring system. Thus, it is still unclear under which conditions a monitoring system is implemented. For example, electronic monitoring is most easily implemented with simple, repetitive tasks (Carayon, 1993; Smith et al., 1992). Thus, a field study that is neglecting the influence of work design might be missing crucial characteristics of monitored work.

Finally, taking the exponential rise in published studies in the fields of work and business psychology and computer science into account, it is astonishing that electronic monitoring has not seen this exponential trend (note that half of the studies were conducted in or before 2009). The neglect of the importance of electronic monitoring research in these areas is worrisome. Electronic monitoring affects more and more employees and trends like algorithmic management cannot exist without invasive employee monitoring (Galière, 2020; Möhlmann & Zalmanson, 2017). Beyond that, some scholars argue that monitoring is already the default in nowadays technological systems (Johnson et al., 2014) and thus is not a temporal phenomenon but will accompany employees and organizations for a long time. Thus, future research should these trends into account and gather more knowledge on the effects of electronic monitoring.

5.2. Practical implications

Practitioners and decision-makers in organizations should keep in mind how they implement and use a monitoring system. In addition, there should be special attention on what an organization expects from a monitoring system. The current study showed a detrimental impact of electronic monitoring not only on employees but also on organizations. Without showing a direct performance benefit but increased deviance, there is also no clear benefit for organizations. The current meta-analysis showed only small influences of electronic monitoring on employees. Thus, it is likely that HR measures which go in line with the use of electronic monitoring system strengthen or weaken the impact of the monitoring system. Supervisors in an organization should be able to communicate the purpose of a monitoring system to employees and how their data is used. In addition, it is necessary to create a space of autonomy for employees even though a monitoring system exists. This might help to reduce the negative impact of electronic monitoring.

5.3. Conclusion

The aim of the current meta-analysis was to summarize previous research regarding the effect of electronic monitoring on job satisfaction, stress, performance, and CWB. Based on our findings, electronic monitoring has a detrimental impact on employees as well as organizations. Employees perceive reduced job satisfaction and increased stress when monitored. On an organizational level, it is likely that there is no gain in employees' performance but increased deviant behavior. These results question currently existing justifications for the use of electronic monitoring.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We acknowledge support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) and Saarland University within the funding programme Open Access Publishing.

Work on this meta-analysis was supported by the Kooperationsstelle für Wissenschaft und Arbeitswelt (KoWA) and Arbeitskammer Saarland (Project: "Auswirkungen des elektronischen Überwacht-Werdens auf Arbeitnehmerinnen und Arbeitnehmer" [The impact of electronic monitoring on employees]).

Appendix A. Included studies

The following studies were included in the current meta-analysis (for unpublished studies please write to the corresponding author of this meta-analysis):

- Adams and Mastracci (2019); Aiello and Svec (1993); Aiello and Kolb (1995); Bartels and Nordstrom (2012); Becker and Marique (2014); Bhave (2014); Camarena and Fusi (2021); Carayon (1994); Carlson et al. (2017); Castanheira and Chambel (2010); Claypoole and Szalma (2019); Claypoole et al. (2019); D'Arcy and Hovav (2008); Davidson and Henderson (2006); Day et al. (2012); Douthitt and Aiello (2001); Galinsky et al. (1995); Galletta and Grant (1995); Gosnell et al. (2020); Greenberg and Barling (1999); Griffith (1993); Hassan et al. (2019); Henderson et al. (1998); Holman et al. (2002); Holman (2002); Holman et al. (2009); Huston et al. (1993); Irving et al. (1986); Jeske and Santuzzi (2014); Jeske and Santuzzi (2015); Jiang (2019); Karim (2015); Kiziloğlu (2018); Kolb and Aiello (1996); Kolb and Aiello (1997); Luo et al. (2022); Luse and Burkman (2020); Mallo et al. (2007); Martin et al. (2016); Mellor et al. (2015); Moorman and Wells (2003); Nebeker and Tatum, 1993; Rafnsdóttir and Gudmundsdottir (2011); Robinson (2020); Rogers et al. (1990); Silverman and Smith (1995); Sprigg and Jackson (2006); Stanton and Julian (2002); Stanton and Sarkar-Barney (2003); Story and Castanheira (2020); Thiel et al. (2021); Thompson et al. (2009); Tomczak et al. (2018); Varca (2006); Visser and Rothmann (2008); Wang et al. (2013); Watson (2008); Watson et al. (2013); Wynne et al. (2018).

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chbr.2022.100227.

References

Adams, I., & Mastracci, S. (2019). Police body-worn cameras: Effects on officers' burnout and perceived organizational support. *Police Quarterly, 22*(1), 5–30.

Aiello, J. R., & Kolb, K. J. (1995). Electronic performance monitoring and social context: Impact on productivity and stress. *Journal of Applied Psychology, 3*(80), 339–353.

Aiello, J. R., & Svec, C. M. (1993). Computer monitoring of work performance: Extending the social facilitation framework to electronic presence. *Journal of Applied Social Psychology, 23*(7), 537–548.

Alge, B. J., & Hansen, S. D. (2013). Workplace monitoring and surveillance research since "1984": A review and agenda. In M. D. Coovert, & L. F. Thompson (Eds.), *The psychology of workplace technology* (pp. 209–237). New York, NY: Routledge.

Alder, S. G., & Ambrose, M. L. (2005). Towards understanding fairness judgments associated with computer performance monitoring: An integration of the feedback, justice, and monitoring research. *Human Resource Management Review, 15*(1), 43–67.

American Management Association. (2007). *Electronic monitoring & surveillance survey*. http://www.epolicyinstitute.com/2007-survey-results.

Armstrong, M. (2006). *Performance management: Key strategies and practical guidelines* (3rd ed). London: Kogan Page.

Aust, F., & Barth, M. (2018). *papaja: Create APA manuscripts with R markdown*. R package version 0.1.0.9842 https://cran.r-project.org/package=papaja.

Backhaus, N. (2019). Context sensitive technologies and electronic employee monitoring: A meta-analytic review. In R. Chatila, & E. Yoshida (Eds.), *2019 IEEE/SICE international symposium on system integration (SII)* (pp. 548–553). Paris, France: Sorbonne Université. ISSN: 2474-2325.

Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology, 10*(2), 170–180.

Ball, K. (2010). Workplace surveillance: An overview. *Labor History, 51*(1), 87–106.

Ball, K. S., & Margulis, S. T. (2011). Electronic monitoring and surveillance in call centres: A framework for investigation. *New Technology, Work and Employment, 26*(2), 113–126.

Bartels, L. K., & Nordstrom, C. R. (2012). Examining big brother's purpose for using electronic performance monitoring. *Performance Improvement Quarterly, 25*(2), 65–77.

Becker, T. E., & Marique, G. (2014). Observer effects without demand characteristics: An inductive investigation of video monitoring and performance. *Journal of Business and Psychology, 29*(4), 541–553.

Bennett, R. J., & Robinson, S. L. (2000). Development of a measure of workplace deviance. *Journal of Applied Psychology, 85*(3), 349–360.

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

Bosco, F. A., Field, J. G., Larsen, K. R., Chang, Y., & Uggerslev, K. L. (nov 2019). Advancing meta-analysis with knowledge-management platforms: Using metaBUS in psychology. *Advances in Methods and Practices in Psychological Science, 3*(1), 124–137.

Bosco, F. A., Herman, A., Singh, K., Field, J. G., & Pierce, C. A. (2015). Correlational effect size benchmarks. *Journal of Applied Psychology, 100*(2), 431–449.

Camarena, L., & Fusi, F. (2021). Always connected: Technology use increases technostress among public managers. *The American Review of Public Administration, 52*(2), 154–168.

Carayon, P. (1993). Effect of electronic performance monitoring on job design and worker stress: Review of the literature and conceptual model. *Human Factors, 35*(3), 385–395.

Carayon, P. (1994). Effects of electronic performance monitoring on job design and worker stress: Results of two studies. *International Journal of Human–computer Interaction, 6*(2), 177–190.

Carlson, J. R., Carlson, D. S., Zivnuska, S., Harris, R. B., & Harris, K. J. (2017). Applying the job demands resources model to understand technology as a predictor of turnover intentions. *Computers in Human Behavior, 77*, 317–325.

Carroll, W. R. (2008). The effects of electronic performance monitoring on performance outcomes: A review and meta-analysis. *Employee Rights and Employment Policy Journal*, 29–48.

Carter, E. C., Schönbrodt, F. D., Gervais, W. M., & Joseph, H. (2019). Correcting for bias in psychology: A comparison of meta-analytic methods. *Advances in Methods and Practices in Psychological Science, 2*(2), 115–144.

Cascio, W. F., & Montealegre, R. (2016). How technology is changing work and organizations. *Annual Review of Organizational Psychology and Organizational Behavior, 3*(1), 349–375.

Castanheira, F., & Chambel, M. J. (2010). Reducing burnout in call centers through HR practices. *Human Resource Management, 49*(6), 1047–1065.

Chen, J.-C. V., & Ross, W. H. (2005). The managerial decision to implement electronic surveillance at work: A research framework. *International Journal of Organizational Analysis, 13*(3), 244–268.

Cheung, M. W.-L. (2015). metaSEM: An R package for meta-analysis using structural equation modeling. *Frontiers in Psychology, 5*. Article 1521.

Claypoole, V. L., Neigel, A. R., Waldfogle, G. E., & Szalma, J. L. (2019). Evaluative social presence can improve vigilance performance, but vigilance is still hard work and is stressful. *Journal of Experimental Psychology: Human Perception and Performance, 45*(5), 616–627.

Claypoole, V. L., & Szalma, J. L. (2019). Electronic performance monitoring and sustained attention: Social facilitation for modern applications. *Computers in Human Behavior, 94*, 25–34.

D'Arcy, J., & Hovav, A. (2008). Does one size fit all? Examining the differential effects of IS security countermeasures. *Journal of Business Ethics, 89*(S1), 59–71.

Davidson, R., & Henderson, R. (2006). Electronic performance monitoring: A laboratory investigation of the influence of monitoring and difficulty on task performance, mood state, and self-reported stress levels. *Journal of Applied Social Psychology, 30*(5), 906–920.

Day, A., Paquet, S., Scott, N., & Hambley, L. (2012). Perceived information and communication technology (ICT) demands on employee outcomes: The moderating effect of organizational ICT support. *Journal of Occupational Health Psychology, 17*(4), 473–491.

DelVecchio, S. K., Deeter-Schmelz, D. R., & Anselmi, K. (2013). Big brother or big bother? E-Monitoring the salesforce. *Journal of Business & Industrial Marketing, 28*(4), 288–302.

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*(3), 499–512.

DeNisi, A. S., & Murphy, K. R. (2017). Performance appraisal and performance management: 100 years of progress? *Journal of Applied Psychology, 102*(3), 421–433.

Deutscher Gewerkschaftsbund. (2016). *DGB-Index Gute Arbeit. Der Report 2016: Themenschwerpunkt: Die Digitalisierung der Arbeitswelt – eine Zwischenbilanz aus der Sicht der Beschäftigten [DGB index good work. The report 2016: Thematic focus: The digitalization of work – interim conclusions from the employees' point of view]*. Author. http://index-gute-arbeit.dgb.de/veroeffentlichungen/jahresreports/++co++76276168-a0fb-11e6-8bb8-525400e5a74a.

Douthitt, E. A., & Aiello, J. R. (2001). The role of participation and control in the effects of computer monitoring on fairness perceptions, task satisfaction, and performance. *Journal of Applied Psychology, 86*(5), 867–874.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review, 14*(1), 57–74.

Fassina, N. E., Jones, D. A., & Uggerslev, K. L. (2008). Relationship clean-up time: Using meta-analysis and path analysis to clarify relationships among job satisfaction, perceived fairness, and citizenship behaviors. *Journal of Management, 34*(2), 161–188.

Field, A. P. & Gillett, R. (2010). How to do a meta-analysis. *British Journal of Mathematical and Statistical Psychology, 63*(3), 665-694.

Flake, J. K., Pek, J., & Hehman, E. (2017). Construct validation in social and personality research. *Social Psychological and Personality Science, 8*(4), 370–378.

Frey, B. S. (1993). Does monitoring increase work effort? The rivalry with trust and loyalty. *Economic Inquiry, 31*(4), 663–670.

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science, 2*(2), 156–168.

Gagné, M., & Bhave, D. (2011). Autonomy in the workplace: An essential ingredient to employee engagement and well-being in every culture. In V. I. Chirkov, R. M. Ryan, & K. M. Sheldon (Eds.), *Human autonomy in cross-cultural context* (vol. 1, pp. 163–187). Dordrecht, Netherlands: Springer.

Galière, S. (2020). When food-delivery platform workers consent to algorithmic management: A Foucauldian perspective. *New Technology, Work and Employment, 35*(3), 357–370.

Galinsky, T. L., Schleifer, L. M., & Pan, C. S. (1995). The influence of performance standards and feedback on speed and accuracy in an electronically monitored data-entry task. *International Journal of Human-computer Interaction, 7*(1), 25–36.

Galletta, D., & Grant, R. (1995). Silicon supervisors and stress: Merging new evidence from the field. *Accounting, Management and Information Technologies, 5*(3–4), 163–183.

Gerhart, B., & Fang, M. (2015). Pay, intrinsic motivation, extrinsic motivation, performance, and creativity in the workplace: Revisiting long-held beliefs. *Annual Review of Organizational Psychology and Organizational Behavior, 2*(1), 489–521.

Ghislieri, C., Molino, M., & Cortese, C. G. (2018). Work and organizational psychology looks at the fourth industrial revolution: How to support workers and organizations? *Frontiers in Psychology, 9*. Article 2365.

Gosnell, G. K., List, J. A., & Metcalfe, R. D. (2020). The impact of management practices on employee productivity: A field experiment with airline captains. *Journal of Political Economy, 128*(4), 1195–1233.

Greenberg, L., & Barling, J. (1999). Predicting employee aggression against coworkers, subordinates and supervisors: The roles of person behaviors and perceived workplace factors. *Journal of Organizational Behavior, 20*(6), 897–913.

Griffith, T. L. (1993). Monitoring and performance: A comparison of computer and supervisor monitoring. *Journal of Applied Social Psychology, 23*(7), 549–572.

Hassan, W., Shabbir, R., Bashir, M., & Akram, J. (2019). Electronic surveillance consequences: The dark side of technology at workplace. *Pacific Business Review International, 11*(9), 157–170.

Hayes, L. J. B., & Moore, S. (2017). Care in a time of austerity: The electronic monitoring of homecare workers' time. *Gender, Work and Organization, 24*(4), 329–344.

Henderson, R., Mahar, D., Saliba, A., Deane, F., & Napier, R. (1998). Electronic monitoring systems: An examination of physiological activity and task performance within a simulated keystroke security and electronic performance monitoring sytem. *International Journal of Human-Computer Studies, 48*(2), 143–157.

Holland, P. J., Cooper, B., & Hecker, R. (2015). Electronic monitoring and surveillance in the workplace: The effects on trust in management, and the moderating role of occupational type. *Personnel Review, 44*(1), 161–175.

Holman, D. (2002). Employee wellbeing in call centres. *Human Resource Management Journal, 12*(4), 35–50.

Holman, D., Chissick, C., & Peter, T. (2002). The effects of performance monitoring on emotional labor and well-being in call centers. *Motivation and Emotion, 26*(1), 57–81.

Holman, D., Frenkel, S., Sørensen, O., & Wood, S. (2009). Work design variation and outcomes in call centers: Strategic choice and institutional explanations. *ILR Review, 62*(4), 510–532.

Hu, Y.-L., Hung, C.-H., & Ching, G. S. (2016). The impact of monitoring and sanctioning and perceived loafing towards revenge motive and tendency to commit counterproductive work behaviors within the academic workplace. *The International Journal of Risk and Safety in Medicine, 5*(2), 70–95.

Huston, T. L., Galletta, D. F., & Huston, J. L. (1993). The effects of computer monitoring on employee performance and stress: Results of two experimental studies. *Proceedings of the Twenty-Sixth Hawaii International Conference on System Sciences, 4*, 568–574.

Irving, R. H., Higgins, C. A., & Safayeni, F. R. (1986). Computerized performance monitoring systems: Use and abuse. *Communications of the ACM, 29*(8), 794–801.

Iversen, A.-M., Kavalaris, C. P., Hansen, R., Hansen, M. B., Alexander, R., Kostadinov, K., Holt, J., Kristensen, B., Dahl Knudsen, J., Møller, J. K., & Ellermann-Eriksen, S.

(2020). Clinical experiences with a new system for automated hand hygiene monitoring: A prospective observational study. *American Journal of Infection Control, 48*(5), 527–533.
Jeske, D., & Santuzzi, A. M. (2014). Part-time workers' responses to electronic performance monitoring. *International Journal of Wireless Communication, 8*, 63–82.
Jeske, D., & Santuzzi, A. M. (2015). Monitoring what and how: Psychological implications of electronic performance monitoring. *New Technology, Work and Employment, 30*(1), 62–78.
Jiang, H. (2019). Understanding the impact of cyberloafing-related internet monitoring on employee job performance: A field experiment. *Proceedings of the Fortieth International Conference on Information Systems*. https://aisel.aisnet.org/icis2019/governance_is/governance_is/21.
Johnson, N., Li, Y., Tang, F., & Sarker, S. (2014). Are you watching me? A look at panoptic perceptions surrounding computer monitoring systems. *Journal of Information Technology Case and Application Research, 16*(1), 9–26.
Kalaian, H. A., & Raudenbush, S. W. (1996). A multivariate mixed linear model for meta-analysis. *Psychological Methods, 1*(3), 227–235.
Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24*(2), 285–308.
Karim, M. N. (2015). *Electronic Monitoring and self-regulation: Effects of monitoring Purpose on goal state, feedback perceptions, and learning*. George Washington University: PhD thesis. https://scholarspace.library.gwu.edu/concern/gw_etds/k0698749q.
Khakurel, J., Melkas, H., & Porras, J. (2018). Tapping into the wearable device revolution in the work environment: A systematic review. *Information Technology & People, 31*(3), 791–818.
Kiziloğlu, M. (2018). A research on the relationship between workplace monitoring and job stress. *Journal of Organizational Behavior Research, 3*(2), 1–12.
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.
Kolb, K. J., & Aiello, J. R. (1996). The effects of electronic performance monitoring on stress: Locus of control as a moderator variable. *Computers in Human Behavior, 12*(3), 407–423.
Kolb, K. J., & Aiello, J. R. (1997). Computer-based performance monitoring and productivity in a multiple task environment. *Journal of Business and Psychology, 12*(2), 189–204.
Komaki, J. L. (1986). Toward effective supervision: An operant analysis and comparison of managers at work. *Journal of Applied Psychology, 71*(2), 270–279.
Kwon, D., & Reis, I. M. (2015). Simulation-based estimation of mean and standard deviation for meta-analysis via Approximate Bayesian Computation (ABC). *BMC Medical Research Methodology, 15*(1).
Lüdecke, D. (2019). *esc: Effect size computation for meta analysis (Version 0.5.1)*. https://doi.org/10.5281/zenodo.1249218. https://cran.r-project.org/package=esc
Luo, X.(R.), Xu, F., Zhang, J., Xiao, S., & Xue, B. (2022). Effects of organizational controls on employees' cyber-loafing. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems, 53*(1), 61–79.
Luse, A., & Burkman, J. (2020). Wearables in the workplace: Examination using a privacy boundary model. *Journal of the Midwest Association for Information Systems, 2*(2), 7–15.
Mahaney, R. C., & Lederer, A. L. (2011). An agency theory explanation of project success. *Journal of Computer Information Systems, 51*(4), 102–113.
Mallo, J., Nordstrom, C. R., Bartels, L. K., & Traxler, A. (2007). The effect of age and task difficulty. *Performance Improvement Quarterly, 20*(1), 49–63.
Martin, A. J., Wellen, J. M., & Grimmer, M. R. (2016). An eye on your work: How empowerment affects the relationship between electronic surveillance and counterproductive work behaviours. *International Journal of Human Resource Management, 27*, 2635–2651.
McNall, L. A., & Stanton, J. M. (2009). Employee location sensing: Implications for security and privacy. In H. Raghav Rao, & S. Upadhyaya (Eds.), *Information assurance, security and privacy services* (Vol. 4, pp. 481–499). Emerald, Bingley, UK.
Mellor, D., Moore, K. A., & Siong, Z. M. B. (2015). The role of general and specific stressors in the health and well-being of call centre operators. *Work, 52*, 31–43.
Mercado, B. K., Giordano, C., & Dilchert, S. (2017). A meta-analytic investigation of cyberloafing. *Career Development International, 22*(5), 546–564.
Microsoft. (2019). *Workplace analytics*. https://products.office.com/en-us/business/workplace-analytics.
Mitchell, G. (2012). Revisiting truth or triviality: The external validity of research in the psychological laboratory. *Perspectives on Psychological Science, 7*(2), 109–117.
Möhlmann, M., & Zalmanson, L. (2017). Hands on the wheel: Navigating algorithmic management and uber drivers' autonomy. In Y. J. Kim, R. Agarwal, & J. Kyu Lee (Eds.), *Transforming society with digital innovation*. Seoul, South Korea: Association for Information Systems (AIS).
Moorman, R. H., & Wells, D. L. (2003). Can electronic performance monitoring be fair? Exploring relationships among monitoring characteristics, perceived fairness, and job performance. *Journal of Leadership & Organizational Studies, 10*(2), 2–16.
Nebeker, D. M., & Tatum, C. B. (1993). The effects of computer monitoring, standards, and rewards on work performance, job satisfaction, and stress. *Journal of Applied Social Psychology, 23*(7), 508–536.
Neuberger, O., Allerbeck, M., & Ulich, E. (1978). *Messung und Analyse von Arbeitszufriedenheit: Erfahrungen mit dem 'Arbeitsbeschreibungsbogen (ABB)' [Measurement and Analysis of Job Satisfaction: Experiences with the 'Arbeitsbeschreibungsbogen (ABB)']*. Schriften zur Arbeitspsychologie: 26. Bern, Switzerland: Huber.
Nishii, L. H., Lepak, D. P., & Schneider, B. (2008). Employee attributions of the "why" of HR practices: Their effects on employee attitudes and behaviors, and customer satisfaction. *Personnel Psychology, 61*(3), 503–545.
O'Donnell, A. T., Ryan, M. K., & Jetten, J. (2013). The hidden costs of surveillance for performance and helping behaviour. *Group Processes & Intergroup Relations, 16*(2), 246–256.
Oz, E., Glass, R., & Behling, R. (1999). Electronic workplace monitoring: What employees think. *Omega, 27*(2), 167–177.
Parker, S. K. (2014). Beyond motivation: Job and work design for development, health, ambidexterity, and more. *Annual Review of Psychology, 65*(1), 661–691.
Posthuma, R. A., Campion, M. C., & Campion, M. A. (2018). A taxonomic foundation for evidence-based research on employee performance management. *European Journal of Work and Organizational Psychology, 27*(2), 168–187.
R Core Team. (2015). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.
Rafnsdóttir, G. L., & Gudmundsdottir, M. L. (2011). EPM technology and the psychosocial work environment. *New Technology, Work and Employment, 26*(3), 210–221.
Ravid, D. M., Tomczak, D. L., White, J. C., & Behrend, T. S. (2019). EPM 20/20: A review, framework, and research agenda for electronic performance monitoring. *Journal of Management, 46*(1), 100–126.
Reilly, S. M. (2010). *The use of electronic surveillance and performance measures in the workplace: A qualitative investigation*. Unpublished PhD thesis, Durham University.
Robinson, C. C. (2020). *EPM effects on workplace well-being: The role of personality*. Unpublished PhD thesis, University of Waikato, New Zealand.
Rogers, K. J. S., Smith, M. J., & Sainfort, P. C. (1990). Electronic performance monitoring, job design and psychological stress. *Proceedings of the Human Factors Society Annual Meeting, 34*(12), 854–858.
Scammacca, N., Roberts, G., & Stuebing, K. K. (2014). Meta-analysis with complex research designs. *Review of Educational Research, 84*(3), 328–364.
Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How does the digital transformation affect organizations? Key themes of change in work design and leadership. *Management Revue, 29*(2), 114–138.
Sewell, G., & Barker, J. R. (2006). Coercion versus care: Using irony to make sense of organizational surveillance. *Academy of Management Review, 31*(4), 934–961.
Silverman, M. K., & Smith, C. S. (1995). *The effects of human versus computer monitoring of performance on physiological reactions and perceptions of stress* (pp. 181–193). In S. L. Sauter & L. R. Murphy (Eds.), Organizational risk factors for job stress..
Smith, M. J., Carayon, P., Sanders, K. J., Lim, S.-Y., & LeGrande, D. (1992). Employee stress and health complaints in jobs with and without electronic performance monitoring. *Applied Ergonomics, 23*(1), 17–27.
Sprigg, C. A., & Jackson, P. R. (2006). Call centers as lean service environments: Job-related strain and the mediating role of work design. *Journal of Occupational Health Psychology, 11*(2), 197–212.
Stanley, T. D., & Doucouliagos, H. (2013). Meta-regression approximations to reduce publication selection bias. *Research Synthesis Methods, 5*(1), 60–78.
Stanton, J. M. (2000). Reactions to employee performance monitoring: Framework, review, and research directions. *Human Performance, 13*(1), 85–113.
Stanton, J. M., & Julian, A. L. (2002). The impact of electronic monitoring on quality and quantity of performance. *Computers in Human Behavior, 18*(1), 85–101.
Stanton, J. M., & Sarkar-Barney, S. T. M. (2003). A detailed analysis of task performance with and without computer monitoring. *International Journal of Human-Computer Interaction, 16*(2), 345–366.
Stanton, J. M., & Weiss, E. M. (2000). Electronic monitoring in their own words: An exploratory study of employee's experiences with new types of surveillance. *Computers in Human Behavior, 16*(4), 423–440.
Story, J., & Castanheira, F. (2020). How hybrid HR systems affect performance in call centers. *Personnel Review, 50*(3), 918–934.
Tamuz, M. (1987). The impact of computer surveillance on air safety reporting. *The Columbia Journal of World Business, 22*(1), 69–77.
Thiel, C., Bonner, J., Bush, J., Welsh, D., & Garud, N. (2021). Stripped of agency: The paradoxical effect of employee monitoring on deviance. *Academy of Management Proceedings, 2021*(1), Article 11632.
Thompson, L. F., Sebastianelli, J. D., & Murray, N. P. (2009). Monitoring online training behaviors: Awareness of electronic surveillance hinders e-learners. *Journal of Applied Social Psychology, 39*(9), 2191–2212.
Tipton, E., & Pustejovsky, J. E. (2015). Small-sample adjustments for tests of moderators and model fit using robust variance estimation in meta-regression. *Journal of Educational and Behavioral Statistics, 40*(6), 604–634.
Tomczak, D. L., Lanzo, L. A., & Herman, A. (2018). Evidence-based recommendations for employee performance monitoring. *Business Horizons, 61*(2), 251–259.
Vanhove, A. J., & Harms, P. D. (2015). Reconciling the two disciplines of organisational science: A comparison of findings from lab and field research. *Applied Psychology, 64*(4), 637–673.
Van den Noortgate, W., López-López, J. A., Marín-Martínez, F., & Sánchez-Meca, J. (2012). Three-level meta-analysis of dependent effect sizes. *Behavior Research Methods, 45*(2), 576–594.
Varca, P. E. (2006). Telephone surveillance in call centers: Prescriptions for reducing strain. *Managing Service Quality: An International Journal, 16*(3), 290–305.
Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software, 36*(1), 1–48.
Visser, W. A., & Rothmann, S. (2008). Exploring antecedents and consequences of burnout in a call centre. *SA Journal of Industrial Psychology, 34*(2).
de Vries, R. E., & van Gelder, J.-L. (2015). Explaining workplace delinquency: The role of honesty–humility, ethical culture, and employee surveillance. *Personality and Individual Differences, 86*, 112–116.
Wang, J., Tian, J., & Shen, Z. (2013). The effects and moderators of cyber-loafing controls: An empirical study of Chinese public servants. *Information Technology and Management, 14*(4), 269–282.

Watson, A. M. (2008). *Electronic monitoring relevance and justification: Implications for procedural justice and satisfaction*. (Unpublished PhD thesis, North Carolina State University).

Watson, A. M., Thompson, L. F., Rudolph, J. V., Whelan, T. J., Behrend, T. S., & Gissel, A. L. (2013). When big brother is watching: Goal orientation shapes reactions to electronic monitoring during online training. *Journal of Applied Psychology, 98*(4), 642–657.

Wells, D. L., Moorman, R. H., & Werner, J. M. (2007). The impact of the perceived purpose of electronic performance monitoring on an array of attitudinal variables. *Human Resource Development Quarterly, 18*(1), 121–138.

Wynne, K. T., Biermeier-Hanson, B., Liu, M. Q., & Lyons, J. B. (2018). Leadership, monitoring, trustworthiness, and deviance: A moderated-mediation model. *Paper presented at the 33rd Annual Conference of the Society for Industrial and Organizational Psychology* (SIOP).

Yost, A. B., Behrend, T. S., Howardson, G., Darrow, J. B., & Jensen, J. M. (2018). Reactance to electronic surveillance: A test of antecedents and outcomes. *Journal of Business and Psychology, 34*(1), 71–86.

Yukl, G. A. (2012). *Leadership in organizations* (8th ed.). Edinburgh, UK: Pearson.