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The impact of corporate social responsibility on cybersecurity behavior: The crucial role of organizationally-prescribed perfectionism

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This study delves into the ways in which corporate social responsibility (CSR) affects cybersecurity behavior among employees. It specifically examines the mediating effects of psychological safety and job stress, as well as the moderating role of organizationally-prescribed perfectionism. Drawing on theories of social identity, social exchange, and the job demands-resources model, we postulate that CSR influences cybersecurity behavior in employees in a positive way, first through psychological safety and then through job stress as a sequential mediator. We also look at how organizationally-prescribed perfectionism moderates the connection between CSR and psychological safety. Our research design was based on collecting survey data from 402 employees in South Korea at four different time points. Our findings support the idea that CSR has a direct and indirect positive effect on cybersecurity behavior among employees through measures such as increased psychological safety and decreased job stress. In addition, the study discovered that when employees have high levels of organizationally-prescribed perfectionism, it reduces the favorable effect of CSR on psychological safety. Our findings further the current literature by illuminating the psychological processes and boundary circumstances that govern the impact of CSR on cybersecurity behavior among employees. CSR programs can promote safe online habits and boost morale, but it's important for businesses to remember that employees have different levels of perfectionism and to accommodate those variations. In this paper, we discuss the study's shortcomings and provide suggestions for further research to support a holistic strategy for CSR in the IT age.

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Introduction

Corporate social responsibility (CSR) has emerged as a critical factor in the performance and longevity of organizations in today's dynamic business landscape (Aguinis et al. 2020; Fatima & Elbanna, 2023; Onkila & Sarna, 2022; Velte, 2021). Academic research has paid much attention to CSR, a complex issue, in the last few decades. CSR refers to the business community's voluntary efforts to balance economic growth with social and environmental responsibility (Carroll, 2016). Positioning businesses as proactive contributors to societal and environmental well-being, this approach challenges the traditional perception of them as just profit-driven enterprises (Aguinis & Glavas, 2019). Embedding CSR into fundamental business strategy and operations is becoming more important for firms as stakeholder demands for SDG compliance grow (Gond et al. 2017). The increasing need for CSR was highlighted by a recent PwC survey (2021) that indicated 83% of worldwide customers expect corporations to help with social and environmental challenges. Employees are an important internal stakeholder, and it is becoming more important to understand how CSR affects them, in contrast to the well-documented benefits of CSR for communities and customers (Glavas, 2016). (Rupp & Mallory, 2015).

In today's demanding and ever-changing workplace, it is essential to study how CSR influences workers' views, attitudes, and actions (Aguinis & Glavas, 2019; Fatima & Elbanna, 2023; Onkila & Sarna, 2022; Velte, 2021). Recognizing the impact of CSR on employee experiences and reactions is crucial for firms seeking to recruit, retain, and inspire top talent (Bavik et al. 2018). As a result of the importance of CSR in attracting and retaining talent, Deloitte (2020) found that 77% of millennials think about a company's CSR initiatives when deciding where to work. Organizational citizenship behavior, work satisfaction, and organizational commitment are among the outcomes that can be impacted by CSR, according to research (Fatima & Elbanna, 2023; Gond et al. 2017; Onkila & Sarna, 2022). Aguinis et al. (2020) and Fatima and Elbanna (2023) point out that there is a growing amount of literature on CSR and employee reactions. However, there are still certain gaps in our understanding of the intricate relationship between CSR and employee behaviors in contemporary firms.

Researchers have paid little attention to how CSR affects cybersecurity behavior among employees (Fatima & Elbanna, 2023; Muthukrishna & Henrich, 2019; Onkila & Sarna, 2022). According to Alsharida et al. (2023) and Shaikh and Siponen (2023), cyber risks in the modern digital era can have serious effects on companies and their stakeholders. The examination of CSR's influence on cybersecurity behavior is both theoretically and practically crucial for several reasons. First, resolving cybersecurity threats is of utmost importance, as the estimated yearly worldwide cost of cybercrime will be \$10.5 trillion by 2025 (Cybersecurity Ventures, 2020). Second, drawing on social identity theory, when employees strongly identify with their organization through CSR initiatives, they are more likely to engage in protective behaviors to safeguard organizational assets, including digital resources. Third, based on social exchange theory, when organizations demonstrate care for stakeholders through CSR, employees are more likely to reciprocate through positive security behaviors. The impact of CSR on employee cybersecurity behavior has been understudied while several antecedent factors of cybersecurity behavior like awareness, training, and organizational culture have been examined (Alsharida et al. 2023; Anwar et al. 2017; Li et al. 2019). Given the growing significance of cybersecurity in the workplace, it is essential to study how corporate social responsibility (CSR) affects cybersecurity behavior among employees (Pollini et al. 2022). Only then can we fully grasp how organizations can promote a safe digital environment.

Second, there is also a paucity of research on the mediating and moderating variables that explain the connection between CSR and cybersecurity practices among employees (Fatima & Elbanna, 2023; Onkila & Sarna, 2022). Exploring mediating variables, such as employees' perceptions of psychological safety and job stress, can provide essential insights into why and how CSR impacts employee cybersecurity behavior (Hewett et al. 2018). Psychological safety, defined as the degree to which members of a team feel comfortable enough to take risks with one another in the context of the team's work (Edmondson, 1999), is a crucial factor in fostering employee engagement and proactive behavior (Frazier et al. 2017). Conversely, job stress is associated with diminished employee well-being and performance (Koslowsky, 2018). Understanding how these variables mediate the association between CSR and employee cybersecurity behavior can illuminate the psychological processes underlying this relationship. Furthermore, examining moderating factors, such as individual differences in organizationally-prescribed perfectionism, can help identify the conditions under which CSR's impact on employee responses is amplified or diminished (Ocampo et al. 2020).

The third area that needs more investigation is the role that organizationally-prescribed perfectionism plays in mediating the connection between CSR and employee reactions (Fatima & Elbanna, 2023; Onkila & Sarna, 2022). In today's highly competitive work environment, many organizations emphasize perfection and maintain high performance standards (Ozbilir et al. 2015). The American Psychological Association found in a 2020 survey that 30% of workers experience too much pressure to perform flawlessly on the job. Employees who perceive that their organization demands flawless work and imposes unrealistic expectations may experience increased stress and reduced well-being (Ocampo et al. 2020). Despite the potential significance of organizationally-prescribed perfectionism in shaping employee responses to CSR, extant works have not thoroughly delved into this moderating impact. Examining how organizationally-prescribed perfectionism influences the CSR-employee outcomes link can offer valuable insights into the boundary conditions or contextual factors which affect the efficacy of CSR initiatives in modern organizations (Fatima & Elbanna, 2023; Onkila & Sarna, 2022; Velte, 2021).

In order to fill these gaps in knowledge, this study develops a comprehensive model explaining how CSR impacts employee cybersecurity behavior, mediated by psychological safety and job stress, and moderated by organizationally-prescribed perfectionism. Our selection of psychological safety and job stress as sequential mediators is theoretically grounded in several frameworks. Drawing on the job demands-resources (JD-R) model, we propose that CSR, as an organizational resource, influences employee outcomes through both motivational (psychological safety) and health-impairment (job stress) processes. Additionally, according to the conservation of resources (COR) theory, CSR first builds psychological safety (resource gain), which then buffers against job stress (resource loss), ultimately influencing security behavior. The choice of organizationally-prescribed perfectionism as a moderator is anchored in person-environment fit theory, suggesting that when organizations emphasize both CSR and perfectionistic standards, employees may experience varying levels of psychological safety depending on their ability to reconcile these potentially conflicting demands.

These theories provide a robust foundation for understanding the intricate interplay between organizational factors (CSR), individual factors (organizationally-prescribed perfectionism), and employee responses (psychological safety, job stress, and cybersecurity behavior). Through integrating the theoretical perspectives, the current paper aims to offer an intricate

understanding of how CSR affects cybersecurity behavior and under what conditions this relationship is either strengthened or weakened.

The current research may make four significant contributions to the literature on CSR and cybersecurity. First, it addresses the overlooked impact of CSR on employee cybersecurity behavior, offering a fresh perspective on how socially responsible practices can shape employees' attitudes and behaviors related to organizational security. Specifically, we extend CSR literature by identifying cybersecurity behavior as a novel and critical outcome of CSR initiatives, demonstrating how CSR can influence specific protective behaviors beyond traditional performance metrics. Simultaneously, we contribute to cybersecurity literature by introducing CSR as a previously unexplored antecedent of security behavior, showing how organizational initiatives beyond conventional security policies can enhance cybersecurity outcomes. Second, via investigating the mediation effects of psychological safety and job stress, we can offer meaningful insights into the psychological processes that explain the relationship between CSR and employee cybersecurity behavior, enhancing the understanding of the intricate interaction between organizational factors and individual responses. This dual contribution advances both CSR research by revealing new psychological mechanisms through which CSR affects employee behavior, and cybersecurity research by identifying how CSR-driven psychological states promote security compliance. Third, by considering organizationally-prescribed perfectionism as a moderator, this research highlights the contextual factors that affect the efficacy of corporate social responsibility, emphasizing the significance of individual differences in the context of socially responsible practices. Finally, by integrating multiple theories, this study develops a comprehensive framework that captures the nuanced relationships between CSR and cybersecurity behavior, contributing to theoretical and practical advancements in these fields. By bridging CSR and cybersecurity domains, our research provides organizations with integrated insights for enhancing both their social responsibility initiatives and security management practices.

Theory and hypotheses

The theoretical framework of this study integrates the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2017; Demerouti et al. 2001) and the Conservation of Resources (COR) theory (Hobfoll, 1989; Hobfoll et al. 2018) to provide a comprehensive understanding of how CSR influences cybersecurity behavior. While these theories share some commonalities in their approach to understanding workplace behavior (Bakker et al. 2014), they serve complementary roles in explaining the mechanisms through which CSR affects employee outcomes. The JD-R model provides the structural foundation for understanding how organizational resources, particularly CSR initiatives, influence employee outcomes through dual pathways (Schaufeli & Taris, 2014). In the motivational pathway, CSR functions as an organizational resource that enhances psychological safety, promoting positive behavioral outcomes (Crawford et al. 2010). Simultaneously, through the health-impairment pathway, this enhanced psychological safety serves as a buffer against job stress, ultimately affecting security behavior (Bakker & Demerouti, 2014).

This structural understanding is enriched by COR theory, which illuminates the psychological mechanisms underlying these processes (Hobfoll et al. 2018). COR theory explains why employees actively engage with CSR initiatives through the lens of resource management (Halbesleben et al. 2014). When organizations invest in CSR, they create opportunities for resource

acquisition (El Akremi et al. 2018), allowing employees to build psychological resource reservoirs through enhanced safety and support. These accumulated resources, manifested as psychological safety, enable employees to better manage job demands and maintain the cognitive and emotional resources necessary for effective security behavior (Newman et al. 2017). Furthermore, this resource accumulation helps prevent resource loss by reducing job stress (Hobfoll, 1989), ensuring employees maintain sufficient resources for sustained security practices (D'Arcy et al. 2014).

The integration of these theoretical perspectives offers a nuanced understanding of the CSR-cybersecurity behavior relationship (Jones et al. 2019). The JD-R model explains how CSR operates as an organizational resource system (Bakker & Demerouti, 2017), while COR theory elucidates why employees invest in and utilize these resources (Hobfoll et al. 2018). Together, they provide a robust theoretical foundation for understanding how CSR initiatives translate into concrete behavioral outcomes in the cybersecurity context (Crossler et al. 2013).

CSR and cybersecurity behavior. This paper proposes that CSR will enhance employee cybersecurity behavior. CSR has become a crucial factor in shaping employee attitudes and behaviors within organizations (Aguinis & Glavas, 2019). While previous research has extensively explored CSR's impact on several employee outcomes, including organizational commitment, work engagement, organizational citizenship behavior, and task performance (Fatima & Elbanna, 2023; Gond et al. 2017; Onkila & Sarna, 2022), little is known about how it influences cybersecurity practices (Fatima & Elbanna, 2023; Onkila & Sarna, 2022; Velte, 2021). Cybersecurity behavior, an emerging concept in information security, focuses on the human factors influencing individuals' actions and decisions related to cybersecurity. It encompasses users' attitudes, knowledge, and practices that contribute to protecting or exposing an organization's information assets (Anwar et al. 2017; Kannelønning & Katsikas, 2023). Given that human error and negligence are often cited as major contributors to cybersecurity breaches (Pollini et al. 2022), understanding and promoting positive cybersecurity behavior has become increasingly important for organizations.

Drawing upon the job demands-resources (JD-R) model, we propose that corporate social responsibility (CSR) can significantly enhance employee cybersecurity behavior. The JD-R model posits that workplace characteristics can be classified into job demands that require sustained effort and job resources that help achieve work goals and reduce job demands (Bakker & Demerouti, 2017). Within this framework, CSR initiatives can function as crucial organizational resources that support employees through both motivational and health-impairment processes (Schaufeli & Taris, 2014).

The JD-R model suggests that organizational resources, such as CSR, can influence employee outcomes through two parallel processes: a motivational process and a health-impairment process (Bakker & Demerouti, 2014). In the motivational process, CSR as an organizational resource can foster positive psychological states, such as psychological safety, leading to increased work engagement and positive behavioral outcomes (Demerouti et al. 2019). Simultaneously, through the health-impairment process, CSR can buffer against job demands and reduce stress-related outcomes, thereby preventing the depletion of employees' energy and maintaining their capacity to engage in protective behaviors (Bakker et al. 2014).

When organizations implement CSR initiatives, they provide employees with valuable resources that can enhance both their motivation and capacity to engage in cybersecurity behavior

(Bulgurcu et al. 2010). Through the motivational pathway, CSR creates a supportive environment where employees feel valued and psychologically safe, increasing their willingness to invest in behaviors that protect organizational interests (El Akremi et al. 2018). Concurrently, through the health-impairment pathway, CSR helps reduce job stress by providing resources that buffer against job demands, enabling employees to maintain the cognitive and emotional resources necessary for effective cybersecurity practices (Crawford et al. 2010).

Prior empirical evidence supports this dual-process perspective, demonstrating that organizational resources provided through CSR can simultaneously enhance employees' motivational states and reduce stress-related outcomes (Glavas, 2016). This dual impact of CSR, operating through both motivational and health-impairment processes, can create optimal conditions for employees to engage in and maintain effective cybersecurity behaviors (Ifinedo, 2014).

Therefore, based on the JD-R model and existing empirical evidence, we propose:

Hypothesis 1: CSR will enhance cybersecurity behavior.

CSR and psychological safety. This study argues that implementing Corporate Social Responsibility (CSR) practices will improve the psychological safety of employees. Psychological safety is the collective perception held by team members that the team's atmosphere encourages them to take interpersonal risks, enabling them to freely express their thoughts, concerns, and questions without worrying about facing adverse outcomes (Edmondson, 1999). In a psychologically safe setting, employees feel comfortable being themselves, admitting mistakes, and challenging the status quo, which fosters learning, innovation, and performance (Edmondson & Lei, 2014). The benefits of psychological safety for both individual and team results are extensively demonstrated in the literature. At the individual level, it has been associated with heightened levels of job engagement, job satisfaction, and creativity (Kark & Carmeli, 2009). At the team level, it has been linked to improved learning, performance, and innovation (Edmondson & Lei, 2014). Google's Project Aristotle, a thorough investigation into team effectiveness, found that psychological safety is the most critical element in influencing the success of a team (Duhigg, 2016).

Drawing upon the conservation of resources (COR) theory, we propose that CSR can significantly enhance employee psychological safety. The COR theory suggests that individuals are motivated to obtain, retain, protect, and foster resources, and that they strive to accumulate resources to offset potential resource losses (Hobfoll, 1989). In organizational contexts, CSR initiatives can serve as valuable resource reservoirs that contribute to employees' psychological resource pool by providing tangible and intangible forms of support (Aguinis & Glavas, 2019).

According to COR theory, the availability of resources can create positive resource spirals, where initial resource gains facilitate the acquisition of additional resources (Halbesleben et al. 2014). When organizations invest in CSR activities, they provide employees with various resources, including organizational support, enhanced work conditions, professional development opportunities, and a sense of organizational justice and fairness (El Akremi et al. 2018). These resource gains can create a supportive environment where employees feel psychologically safe to take interpersonal risks, express concerns, share ideas, and seek help without fear of negative consequences (Edmondson & Lei, 2014).

Furthermore, COR theory emphasizes that individuals with greater resources are better positioned to invest in acquiring new resources, leading to positive gain spirals (Hobfoll et al. 2018). CSR initiatives can trigger such gain spirals in multiple ways.

First, by demonstrating organizational commitment to employee well-being, CSR provides employees with social and emotional resources that enhance their sense of security and support in the workplace (Gond et al. 2017). Second, CSR activities that focus on employee development and welfare create structural resources that make employees feel valued and protected. Third, the ethical and fair treatment emphasized in CSR initiatives generates moral resources that foster trust and reduce fear of exploitation. These multiple resource gains collectively contribute to creating an environment where psychological safety can flourish (Newman et al. 2017).

The resource accumulation process through CSR also helps create a buffer against potential resource losses, which is crucial for psychological safety. When employees perceive their organization as socially responsible, they feel more secure in taking interpersonal risks because they trust that the organization will support them even if mistakes occur (Carmeli, Gittell, 2009). This perception of organizational support and fairness, derived from CSR initiatives, serves as a psychological buffer that encourages employees to express themselves openly without fear of negative repercussions (Glavas, 2016).

Existing empirical evidence supports this perspective, demonstrating that organizational resources provided through CSR can create conditions conducive to psychological safety (Carmeli, Gittell, 2009). When employees perceive their organization as socially responsible, they experience resource gains that enhance their psychological safety and willingness to engage in interpersonal risk-taking (Glavas, 2016).

Therefore, based on the COR theory and existing empirical evidence, we propose:

Hypothesis 2: CSR will increase employee psychological safety.

Psychological safety and job stress. This study posits that fostering employee psychological safety can significantly reduce levels of job stress. Job stress is characterized as the detrimental physiological and psychological reactions that arise when job demands exceed an employee's capacity, resources, or needs (Ganster & Rosen, 2013). It emerges from the interaction between an individual and their work environment, where job pressures and challenges strain the employee's ability to cope effectively (Bakker & Demerouti, 2017). Job stress has been associated with negative organizational outcomes, including increased absenteeism, higher turnover rates, and decreased productivity (Goh et al. 2015). The financial burden of job stress is substantial, costing organizations billions of dollars annually in healthcare expenses and lost productivity (Hassard et al. 2018).

Drawing upon the job demands-resources (JD-R) model, we propose that psychological safety can significantly reduce employee job stress. The JD-R model posits that job characteristics can be categorized into demands that require sustained effort and resources that help employees cope with these demands (Bakker & Demerouti, 2017). Within this framework, psychological safety functions as a crucial job resource that can buffer against job demands and minimize stress experiences through multiple pathways (Edmondson and Lei, 2014).

The JD-R model suggests that job resources play a vital role in reducing the negative impact of job demands through a health-impairment process (Schaufeli and Taris, 2014). When employees experience psychological safety in their work environment, they gain access to three critical types of resources that help manage workplace challenges. First, psychological safety provides emotional resources by creating an environment where employees feel secure and supported. Second, it offers social resources by enabling access to collegial support and collaborative problem-solving opportunities. Third, it provides cognitive resources by

reducing the mental energy spent on self-protection and impression management (Newman et al. 2017). These multiple resource mechanisms collectively help employees better manage job demands and reduce stress accumulation.

Furthermore, the JD-R model emphasizes that job resources can buffer against the adverse effects of job demands by providing employees with effective coping mechanisms (Bakker et al. 2014). Psychological safety facilitates stress reduction through several specific processes. First, it enables employees to openly discuss work-related challenges without fear of negative consequences, allowing for early identification and resolution of potential stressors. Second, it promotes collaborative problem-solving by encouraging team members to share knowledge and expertise. Third, it reduces emotional labor by allowing authentic self-expression and reducing the need to suppress concerns or emotions. Fourth, it facilitates access to organizational support systems by removing interpersonal barriers to help-seeking behavior (Carmeli and Gittell 2009).

The stress-reducing effect of psychological safety is further enhanced through its impact on resource conservation and acquisition. In psychologically safe environments, employees can focus their energy on task completion rather than self-protection, leading to more efficient resource utilization. They can also more effectively build and maintain support networks, creating resource reservoirs for future challenges. Additionally, the reduced fear of negative consequences allows employees to experiment with new coping strategies and learn from failures, thereby expanding their repertoire of stress management techniques (Frazier et al. 2017).

Previous empirical evidence supports this perspective, showing that psychologically safe environments facilitate stress reduction through multiple mechanisms (Frazier et al. 2017). When employees feel psychologically safe, they are more likely to engage in proactive problem-solving, seek social support, and utilize available resources to manage work demands, ultimately reducing their experience of job stress (Baer and Frese, 2003).

Therefore, based on the JD-R model and existing empirical evidence, we propose:

Hypothesis 3: Psychological safety would decrease his or her job stress.

Job stress and cybersecurity behavior. Employee job stress is a significant factor that influences cybersecurity behavior (Li et al. 2021). By drawing on the conservation of resources theory, the job demands-resources model, the transactional model of stress and coping (Lazarus & Folkman, 1984), and the protection motivation theory (Rogers, 1975), we propose that job stress can negatively impact employees' cybersecurity practices.

Drawing upon the conservation of resources (COR) theory, we propose that job stress can significantly impair employee cybersecurity behavior. The COR theory posits that individuals strive to obtain, retain, and protect their valued resources, and that stress occurs when these resources are threatened, lost, or inadequately replenished after investment (Hobfoll, 1989). In the context of cybersecurity, job stress can deplete employees' cognitive and emotional resources, reducing their capacity to maintain effective security practices (Bulgurcu et al. 2010).

According to COR theory, resource depletion through stress can trigger a negative spiral where initial resource loss leads to increased vulnerability to further resource depletion (Hobfoll et al. 2018). When employees experience high levels of job stress, they expend significant resources managing immediate work demands and emotional strain, leaving fewer resources available for maintaining vigilant cybersecurity behavior (D'Arcy et al. 2014). This resource depletion can manifest in reduced attention

to security protocols, decreased capacity for threat detection, and diminished motivation to comply with security policies.

Furthermore, COR theory emphasizes that individuals under stress tend to adopt defensive postures to prevent further resource loss (Halbesleben et al. 2014). In the context of cybersecurity, stressed employees may view security practices as additional resource-demanding tasks rather than essential protective measures (Ifinedo, 2014). This defensive stance can lead to shortcuts in security procedures, delayed system updates, or ignored security warnings as employees attempt to conserve their remaining resources for managing immediate job demands.

The resource-depleting effects of job stress can particularly impact the quality of cybersecurity behavior in three ways. First, stress reduces the cognitive resources necessary for maintaining security awareness and recognizing potential threats. Second, it diminishes the emotional resources required for sustained vigilance and compliance motivation. Third, it impairs the self-regulatory resources needed to consistently follow security protocols, especially when faced with competing job demands (Posey et al. 2015).

Therefore, based on the COR theory and existing empirical evidence, we propose:

Hypothesis 4: Job stress would diminish cybersecurity behavior.

The sequential mediating effect of psychological safety and job stress in the CSR-cybersecurity behavior link. Building on the context-attitude-behavior (CAB) framework (Guy et al. 2015), this study suggests that CSR, as a contextual factor, may affect employee cybersecurity behavior via the sequential mediating effect of psychological safety and job stress, which function as attitudinal components. The CAB framework is a theoretical model that examines the connections between an individual's context, attitudes, and subsequent behavior. According to this framework, an individual's attitudes are shaped by their context, which subsequently influences their behavior (Guy et al. 2015). The CAB framework has been applied across various domains, including health psychology, consumer behavior, and organizational psychology, to understand and predict decision-making processes and actions (Albarracín & Shavitt, 2018). In organizational settings, CSR initiatives can be viewed as a significant contextual factor that shapes employees' attitudes and subsequent behaviors (Gond et al. 2017).

Specifically, we propose that CSR (context) will positively affect psychological safety (attitude), which in turn will reduce job stress (attitude), ultimately leading to enhanced employee cybersecurity behavior (behavior). This sequential mediation pathway highlights the intricate interplay between organizational context, employee attitudes, and cybersecurity behavior, underscoring the importance of cultivating a socially responsible and psychologically safe work environment to promote desirable cybersecurity outcomes.

CSR can cultivate a sense of psychological safety among employees via fostering the organization's commitment to ethical and socially responsible practices (Caesens et al. 2020; De Roeck & Maon, 2018; Ge, 2020). Psychological safety is a crucial attitudinal factor that can mediate the relationship between contextual factors and employee behavior (Newman et al. 2017). When employees regard their organization as socially responsible, they are more inclined to have a sense of support, appreciation, and stability in their work environment (Islam et al. 2016), thereby enhancing their psychological safety. In turn, psychological safety can influence employees' levels of job stress. Job stress is another critical attitudinal component that can shape employee behavior, including cybersecurity behavior (Albarracín & Shavitt,

2018; Bakker & Demerouti, 2007). The CAB framework posits that attitudes, such as job stress, can guide behavior and decision-making (Albarracín & Shavitt, 2018). Due to the exhaustion of mental and emotional resources, workers whose jobs cause them a great deal of stress are less likely to prioritize and follow cybersecurity policies and best practices (Singh et al. 2023; Li et al. 2019). Employees may be better equipped to participate in proactive and watchful cybersecurity practices when they are not as stressed out by their jobs (Chen et al. 2022; Nadeem et al. 2024).

Hypothesis 5: Psychological safety and job stress will sequentially mediate the CSR-cybersecurity behavior link.

The moderating role of organizationally-prescribed perfectionism in the CSR-psychological safety link. This research proposes that organizationally-prescribed perfectionism acts as a moderator which weakens the positive influence of CSR on psychological safety. Organizationally-prescribed perfectionism, an emerging concept in organizational psychology, extends the notion of socially-prescribed perfectionism to the workplace. It refers to the belief that one's organization demands perfect performance and holds unrealistically high expectations for its employees (Hewitt & Flett, 1991; Ozbilir, Day, & Catano, 2015). Employees experiencing high levels of organizationally-prescribed perfectionism feel that their organization expects flawless work and that mistakes or failures to meet these standards will result in negative consequences, such as criticism, disapproval, or even job loss (Ocampo et al. 2020; Sherry, Stoeber & Ramasubbu, 2016).

Using the person-environment fit theory (Edwards et al. 1998) and the social information processing theory (Salancik & Pfeffer, 1978), we suggest that organizationally-prescribed perfectionism can negatively moderate the increasing impact of CSR on employee psychological safety. This connection is likely to be weaker when organizationally-prescribed perfectionism is high and stronger when it is low.

First, the person-environment fit theory proposes that the alignment between an individual's characteristics and their work environment influences their attitudes and behaviors (Edwards et al. 1998). When there is a misfit between employees' personal values and organizational expectations, they may experience cognitive dissonance, stress, and reduced well-being (Newton & Mazur, 2016). In the context of CSR and psychological safety, employees with high organizationally-prescribed perfectionism may perceive a misfit between the organization's socially responsible initiatives and the unrealistic demands for flawless performance (Ozbilir et al. 2015). This perceived mismatch can undermine the positive impact of CSR on psychological safety, as

these employees might feel that the organization's commitment to social responsibility is inconsistent with the pressure to meet perfectionistic standards (Ocampo et al. 2020).

Second, according to the conservation of resources theory, employees with high levels of organizationally-prescribed perfectionism might see CSR initiatives as a threat to their limited resources. These employees tend to invest significant cognitive and emotional resources in striving for flawless performance to meet the organization's perceived expectations (Stoeber & Rennert, 2008). When the organization engages in CSR activities, these employees may view them as additional demands competing for their already stretched resources, leading to increased stress and reduced psychological safety (Xia et al. 2020).

To illustrate, consider two scenarios in an organization: (1) When organizationally-prescribed perfectionism is high: In a company that strongly emphasizes CSR, employees who perceive high levels of organizationally-prescribed perfectionism might feel that the socially responsible initiatives conflict with the demand for flawless performance. For example, in a financial services firm emphasizing CSR through community outreach programs, an employee with high perfectionism might feel that participating in these programs detracts from their core responsibilities, which they believe must be executed flawlessly. This perceived conflict can increase stress and reduce psychological safety, as the employee may feel unable to discuss their concerns openly without appearing less committed to the organization's goals.

(2) When organizationally-prescribed perfectionism is low: In the same financial services firm, an employee with low levels of organizationally-prescribed perfectionism might view the community outreach programs as opportunities to build stronger relationships with colleagues and develop new skills. They may feel more comfortable discussing challenges and seeking support from team members, perceiving the organization's CSR initiatives as indicative of a caring and inclusive work environment. This can enhance the increasing impact of CSR on psychological safety, fostering a virtuous cycle of trust, collaboration, and employee well-being.

Hypothesis 6: Organizationally-prescribed perfectionism would negatively moderate the impact of CSR on psychological safety, such that the positive connection would be weaker when organizationally-prescribed perfectionism is high and stronger when it is low Fig. 1.

Method

Participants and procedure. This study focused on employed individuals from various sectors in South Korea, aged 20 and

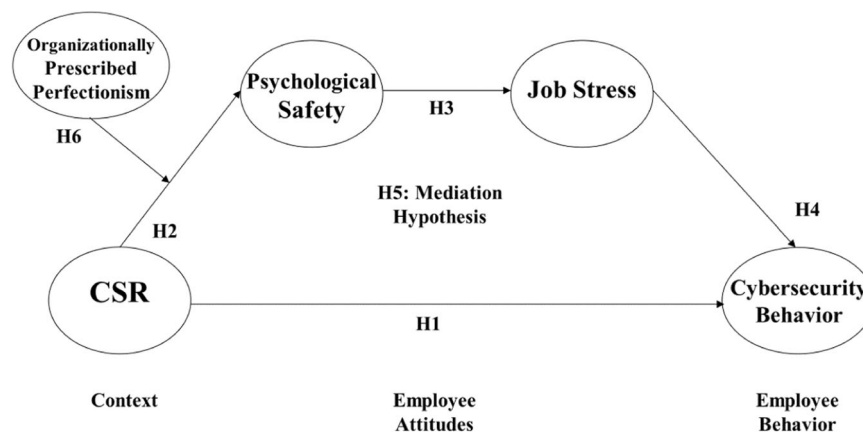


Fig. 1 Theoretical Model.

above. We utilized a four-wave time-lagged design to obtain data at three different intervals. The respondents were enlisted using a well-regarded online research agency with a database of approximately 5.47 million potential participants. To join the study, participants had to provide employment details and verify their identity using either their mobile number or email address. The efficacy of online surveys in capturing diverse participant samples has been validated by previous research, such as Landers & Behrend (2015).

The primary objective of the current research was to obtain multi-wave time-lagged data from actively employed individuals within South Korean enterprises at four distinct points in time, thus addressing the limitations associated with cross-sectional studies. The digital platform allowed meticulous tracking of participant engagement, ensuring consistent involvement of the same individuals at each data collection phase. Data collection sessions were scheduled five to six weeks apart, each lasting two to three days, providing ample time for respondents. Stringent data integrity measures, such as geo-IP restriction traps, were implemented to prevent and correct instances of rapid response submissions, thereby preserving the authenticity of the research outcomes.

The survey company actively reached out to its database, inviting members to participate in the study. Participants were guaranteed that their involvement was optional and their answers would be kept private, exclusively for the purpose of research. Following informed consent, strict adherence to ethical standards was maintained. Participants received a monetary compensation ranging from \$8 to \$9 as recognition for their contribution.

To minimize potential sampling bias, a stratified random sampling technique was employed, categorizing participants into various subgroups to reduce biases related to demographic and occupational variables including age, gender, job title, education level, and industry. This approach was crucial for consistently tracking participation across different digital interfaces, ensuring uniformity in participant involvement throughout the study's stages. This rigorous follow-up was essential for maintaining the integrity of the longitudinal design and ensuring that the collected data accurately reflected the evolving perceptions and experiences of the participants.

Initially, a total of 1071 personnel took part in the project. This figure reduced to 723 in the second phase, further declined to 512 in the third phase, and eventually reached 405 in the fourth phase. Following the process of data collecting, a meticulous cleansing of the datasets was conducted to remove any incomplete information. The ultimate sample consisted of 402 participants who actively engaged in all three surveys, resulting in a response rate of 37.54%. This rate is deemed satisfactory for longitudinal research, aiding in the reduction of potential biases caused by attrition on the findings. The sample size was calculated according to various scholarly guidelines, including the use of G*Power for statistical analysis and adhering to Barclay et al. (1995) recommendation of a minimum of 10 cases per variable. These measures aimed to ensure a sample size adequate enough to detect significant relationships and allow for valid conclusions, balancing the study's statistical power with practical limitations of time and resources.

Moreover, the four-wave time-lagged architecture provides clear benefits compared to simpler cross-sectional setups by enabling researchers to more accurately establish temporal order and infer causality between studied variables. This method also facilitates the exploration of the stability and evolution of constructs over time, providing a deeper understanding of the dynamic interactions between CSR, psychological safety, job stress, cybersecurity behavior, and organizationally-prescribed perfectionism.

Additional data collection (Time Point 5). Following the completion of our initial four-wave study, we conducted an additional survey (Time 5) to specifically examine employees' awareness of corporate social responsibility initiatives. This supplementary data collection occurred approximately 16 weeks after Time 4, maintaining our time-lagged research design. The time gap was chosen to minimize potential common method bias while ensuring continued participation from our sample. Of the 402 participants who completed all four waves of our initial study, 378 responded to our follow-up survey, yielding a 94% response rate. This high retention rate suggests minimal concerns about selective attrition.

The Time 5 survey was administered using the same online platform and quality control measures employed in our initial four waves. We implemented identical data integrity measures, including geo-IP restriction traps and attention check items. Participants received similar compensation to previous waves, and the same confidentiality protections were maintained Table 1.

Measures. During the initial time point, participants were queried regarding their levels of CSR and organizationally-prescribed perfectionism. During the second time point, the emphasis was placed on assessing the degree of psychological safety. Job stress levels were assessed in the third time point, while participants

Table 1 Descriptive Characteristics of the Sample.

Characteristic	Percent
Gender	
Men	51.5%
Women	48.5%
Age (years)	
20-29	21.6%
30-39	23.6%
40-49	27.9%
50-59	26.9%
Education	
High school or below	11.9%
Community college	20.1%
Bachelor's degree	55.7%
Master's degree or higher	12.2%
Position	
Staff	43.0%
Assistant manager	16.4%
Manager or deputy general manager	23.9%
Department/general manager or director and above	16.7%
Firm Size	
1-9 employees	14.9%
10-29 employees	17.9%
30-49 employees	10.4%
50-99 employees	14.9%
100-149 employees	8.5%
150-299 employees	6.7%
300-449 employees	4.2%
500-999 employees	7.2%
1000-4999 employees	9.2%
Above 5000 employees	6.0%
Industry Type	
Manufacturing	22.4%
Services	14.6%
Construction	12.0%
Health and welfare	16.9%
Information services and telecommunications	8.7%
Education	14.9%
Financial/insurance	2.5%
Consulting and advertising	0.7%
Others	7.2%

reported their level of cybersecurity behavior at the fourth time point. The factors were assessed using multi-item measures on a 5-point Likert scale.

CSR (Point in Time 1, as reported by workers). The measurement of CSR was conducted using a set of 12 items that were developed from Turker's CSR scale (2009), which was also utilized by Farooq et al. (2014). The scale evaluates four aspects of CSR: environmental impact, community involvement, employee well-being, and consumer satisfaction, with three specific criteria for each aspect. These items have been employed in prior research conducted in Korea (e.g., Kim et al. 2019a; Kim et al. 2018). Data was gathered at time point one to capture employees' evaluations of their organization's Corporate Social Responsibility (CSR) initiatives. The investigation encompassed the following items: (1) pertaining to the environmental aspect, "Our company participates in activities which aim to protect and improve the quality of the natural environment", (2) pertaining to the community aspect, "Our company contributes to campaigns and projects that promote the well-being of society", (3) pertaining to the employee aspect, "Our company supports employees' growth and development", and (4) pertaining to the customer aspect, "Our company respects consumer rights beyond legal requirements". A value of 0.910 was reported for Cronbach's alpha.

Organizationally-prescribed perfectionism (Point in Time 1, as reported by workers). To assess organizationally-prescribed perfectionism, we adapted the socially prescribed perfectionism subscale from the Multidimensional Perfectionism Scale (MPS) developed by Hewitt and Flett (1991). The original MPS consists of three dimensions: self-oriented perfectionism, other-oriented perfectionism, and socially prescribed perfectionism. For the goal of the current research, we focused on the socially prescribed perfectionism dimension and modified the items to reflect the organizational context, thereby measuring organizationally-prescribed perfectionism.

Organizationally-prescribed perfectionism was assessed using six items adapted from the socially prescribed perfectionism subscale of the MPS. The items were modified to refer to the respondent's organization and colleagues, rather than general social expectations. The items used to measure organizationally-prescribed perfectionism were as follows: "I find it difficult to meet my organization and colleagues' expectations of me", "My organization and colleagues expect me to be perfect", "My organization and colleagues expect me to succeed at everything I do", "My organization and colleagues will like me even if I don't excel at everything (reverse-scored)", "I feel that my organization and colleagues are too demanding of me", "My organization and colleagues think I am still competent even if I make a mistake (reverse-scored)". Items 4 and 6 were reverse-scored, such that higher scores indicated higher levels of organizationally-prescribed perfectionism. When all six questions were summed together, the overall score for organizationally-prescribed perfectionism was determined; a higher score indicated a stronger conviction in one's organization and colleagues demand perfection.

The adapted organizationally-prescribed perfectionism scale showed appropriate internal consistency, with a Cronbach's alpha coefficient of 0.823.

Psychological Safety (Point in Time 2, as reported by workers). Employees' sense of psychological safety was assessed in this study using seven questions drawn from Edmondson's (1999) psychological safety measure. Employees' views on psychological safety are assessed using this scale. Things included in the sample: "It is safe to take a risk in this organization", "I am able to bring up problems

and tough issues in this organization", "It is easy for me to ask other members of this organization for help", and "No one in this organization would deliberately act in a way that undermines my efforts". The items were selected from previous studies which were performed in South Korea (Kim et al. 2021a; Kim et al. 2019b). A value of 0.800 was reported for Cronbach's alpha.

Job stress (Point in Time 3, as reported by workers). To evaluate the extent of job stress, we utilized six items from extant works (DeJoy et al. 2010; Motowidlo et al. 1986). Full items include: "I feel a great deal of stress because of my job", "I experience many stressful events at work", "My job is quite stressful", "I feel frustrated at work", "I feel tense or anxious at work", and "I feel angry or irritated at work". A value of 0.912 was reported for Cronbach's alpha.

Cybersecurity behavior (Point in Time 4, as reported by workers). The current research used six items from the cybersecurity behavior scale of the extant studies (Bulgurcu et al. 2010; Ifinedo, 2012). Full items were "I maintain appropriate privacy/security settings, including on computers I use at work", "I keep the antivirus software on my work computer updated", "I observe and respond appropriately to unusual behavior/reactions on my work computer (e.g., computer slowdown or freeze, pop-up windows, and others)", "On computers I use at work, I don't open attachments or links to unfamiliar URLs in emails from people I do not know", "I don't send sensitive information (account numbers, passwords, social security numbers, etc.) via email or social media from my work computer", and "I back up important files on my work computer". A value of 0.868 was reported for Cronbach's alpha.

CSR awareness (Point in Time 5, as reported by workers). Employee awareness of organizational CSR initiatives was measured using a three-item scale adapted from Kim and Rhee's (2011) CSR communication measure. Participants rated their agreement with the following statements using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree): "I am well-informed about my company's CSR activities", "My organization effectively communicates its CSR initiatives to employees", "I understand how my company's CSR activities relate to its overall mission". The scale demonstrated strong internal consistency (Cronbach's $\alpha = 0.89$).

Control Variables. Following established research practices (Bulgurcu, Cavusoglu, & Benbasat, 2010; Ifinedo, 2012), several factors were included in the study to account for possible confounding variables influencing cybersecurity behavior. These variables, gathered during the initial survey, included employee tenure, gender, position, and education. Including these controls helps mitigate omitted variable bias, ensuring a clearer interpretation of the main factors of this research, as these factors are often linked with cybersecurity behavior.

Common method bias. To address potential common method bias concerns in our self-reported measures, we conducted several statistical tests and implemented research design features to minimize this bias. First, we performed Harman's single-factor test (Podsakoff et al. 2003), where all variables were loaded onto a single factor in an exploratory factor analysis. The unrotated factor solution revealed that no single factor accounted for more than 28.3% of the total variance, suggesting that common method bias is not a major concern in our data. Second, our time-lagged research design with four waves of data collection creates temporal separation between predictor and criterion variables, which

Table 2 Correlation among Research Variables.

	Mean	S.D.	1	2	3	4	5	6	7	8
1. Gender_T1	1.49	0.50	-							
2. Education_T1	2.68	0.84	-0.04	-						
3. Tenure_T1	65.10	71.17	-0.06	0.03	-					
4. Position_T1	2.38	1.49	-0.32**	0.27**	0.31**	-				
5. CSR_T1	3.22	0.71	-0.01	0.20**	0.17**	0.04	-			
6. OPP_T1	2.93	0.67	-0.09	0.11*	-0.04	0.06	-0.01	-		
7. PS_T2	3.23	0.58	-0.03	0.06	0.07	0.18**	0.35**	-0.11*	-	
8. JS_T3	2.91	0.86	-0.05	0.09	-0.13*-	-0.04	-0.10*	0.39**	-0.22**	-
9. CB_T4	3.68	0.70	0.02	0.17**	0.09	0.09	0.25**	-0.07	0.24**	-0.16**

* $p < 0.05$. ** $p < 0.01$. S.D. means standard deviation, CSR means corporate social responsibility, OPP means organizationally-prescribed perfectionism, PS means psychological safety, JS means job stress, and CB means cybersecurity behavior. As for gender, males are coded as 1 and females as 2. As for position, general manager or higher are coded as 5, deputy general manager and department manager 4, assistant manager 3, clerk 2, and others below clerk as 1. As for education, "below high school diploma" level is coded as 1, "community college" level as 2, "bachelor's" level as 3, and "master's degree or more" level is coded as 5.

helps minimize common method bias (Podsakoff et al. 2012). Additionally, we employed different response formats and scale endpoints across measures to reduce common method bias through questionnaire design.

Statistical analysis. A Pearson correlation analysis was performed using SPSS version 28 to analyze the correlations among the study variables once all the data had been collected. Following the two-stage methodological paradigm proposed by Anderson and Gerbing (1988), this study used a measurement model and a structural model. First, Confirmatory Factor Analysis (CFA) was used to check that the measurement model was valid. The AMOS 26 program was utilized to analyze a moderated mediation model, which followed by an examination of the structural model using the maximum likelihood (ML) estimate approach in accordance with SEM principles. This rigorous methodology allowed for a detailed and nuanced exploration of the connections between the study variables, thereby enhancing the accuracy of the findings' interpretation.

Several fit indices were used to evaluate how well the model matched the empirical data. These included the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). In order to conduct a thorough assessment of how well the model fits the data, we followed the accepted academic practices and set the CFI and TLI thresholds to be greater than 0.90 and the RMSEA threshold to be less than 0.06.

Results

Descriptive statistics. The analysis revealed significant correlations among the variables related to CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and cybersecurity behavior. These relationships, detailed in Table 2, provide preliminary empirical support for the proposed hypotheses of the study. The correlation results indicate that CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and cybersecurity behavior are interrelated, potentially influencing one another in meaningful ways. The nature and strength of these correlations offer crucial insights into the mechanisms by which CSR impacts employee cybersecurity behavior and broader organizational outcomes. These findings highlight the complex dynamics between CSR and various human resource outcomes within modern organizational contexts.

CSR awareness analysis. Analysis of the Time 5 data revealed moderate to high levels of CSR awareness among employees ($M = 3.65$, $SD = 0.78$). A detailed examination showed that 72% of respondents ($n = 272$) reported being well-informed about

their company's CSR activities (scores ≥ 4.0 on the first item). Similarly, 68% ($n = 257$) indicated effective organizational communication of CSR initiatives, while 70% ($n = 265$) reported understanding how CSR activities aligned with their organization's mission.

Correlation analyses revealed significant relationships between CSR awareness and our key study variables. CSR awareness showed strong positive correlations with both psychological safety ($r = 0.42$, $p < 0.001$) and cybersecurity behavior ($r = 0.38$, $p < 0.001$), while demonstrating a negative correlation with job stress ($r = -0.25$, $p < 0.01$). Additionally, CSR awareness was positively correlated with our original CSR measure ($r = 0.45$, $p < 0.001$), supporting convergent validity while indicating that these constructs capture distinct aspects of the CSR phenomenon.

To examine the incremental contribution of CSR awareness, we conducted hierarchical regression analyses. In the first step, we entered control variables (gender, education, tenure, position, and time gap between surveys). The second step included our original study variables (CSR, psychological safety, job stress). In the final step, we added CSR awareness. After controlling for all previous variables, CSR awareness explained an additional 8% of variance in psychological safety ($\Delta R^2 = 0.08$, F change = 15.43, $p < 0.001$) and 6% in cybersecurity behavior ($\Delta R^2 = 0.06$, F change = 12.76, $p < 0.001$).

Measurement Model. The study used Confirmatory Factor Analysis (CFA) to examine the fit of the measurement model and determine the uniqueness of the five key variables: CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and cybersecurity behavior. This analysis included a series of chi-square difference tests comparing the five-factor model against simpler constructs: a four-factor model (χ^2 (df = 262) = 1261.827, CFI = 0.795, TLI = 0.765, RMSEA = 0.098), a three-factor model (χ^2 (df = 265) = 1540.135, CFI = 0.738, TLI = 0.704, RMSEA = 0.110), a two-factor model (χ^2 (df = 267) = 1854.415, CFI = 0.674, TLI = 0.634, RMSEA = 0.122), and a one-factor model (χ^2 (df = 268) = 2731.964, CFI = 0.495, TLI = 0.434, RMSEA = 0.151). Based on the evaluation results, the constructs' discriminant validity and their ability to separately represent discrete characteristics of the examined phenomena were confirmed by the five-factor model, which had the greatest fit (chi-square value of (df = 258) = 520.788, CFI = 0.946, TLI = 0.937, RMSEA = 0.050).

The confirmatory factor analysis results robustly validate the construct validity of the measurement model, ensuring that the primary variables are conceptually independent and accurately measured through their respective indicators. This validation is crucial for the precise interpretation of relationships in the subsequent structural model, ensuring that the associations

observed among the variables are not confounded by measurement errors or overlaps in construct definitions. By verifying the discriminant validity of these constructs, the research provides a robust basis for examining the proposed interactions among CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and cybersecurity behavior, thereby enriching the understanding of the intricate dynamics within CSR-enhanced workplaces.

Additionally, employing a two-step analytical method, incorporating both CFA and Structural Equation Modeling (SEM), offers significant methodological advantages. Initially, by establishing a reliable measurement model through CFA, the research ensures that the latent constructs are accurately depicted by their indicators, minimizing measurement inaccuracies and boosting the reliability of the analytical outcomes. The structural modeling phase then facilitates the comprehensive estimation of inter-relationships among these constructs, considering the potential influences of sequential mediating variables like psychological safety and job stress, and moderating variables such as organizationally-prescribed perfectionism. This sophisticated analytical approach not only deepens the insight into how CSR impacts employee cybersecurity behavior and organizational dynamics but also considers the influence of moderating factors in shaping these effects, providing a thorough exploration of the factors driving outcomes in the context of CSR.

Structural model. The research applied a moderated mediation model to examine the proposed hypotheses, integrating both mediation and moderation elements. Within this framework, it was hypothesized that CSR influences cybersecurity behavior indirectly through intermediary variables such as psychological safety and job stress. Furthermore, the model proposed that organizationally-prescribed perfectionism moderates the positive effects of CSR on psychological safety, suggesting that high levels of organizationally-prescribed perfectionism might reduce the positive impacts of CSR on employee cybersecurity behavior.

To construct the interaction term for the moderation analysis, the study multiplied the variables of CSR and organizationally-prescribed perfectionism after centering them around their means. This centering process significantly mitigated issues of multi-collinearity and helped avoid correlation attenuation, ensuring a more precise moderation analysis as outlined by Brace et al. (2003). Centering is crucial in moderation analysis as it isolates the unique variance of the interaction term, distinct from the main effects of the predictor and moderator.

Additionally, the study evaluated potential multi-collinearity by analyzing variance inflation factors (VIF) and their corresponding tolerance values, following guidelines by Brace et al. (2003). The VIF values for both CSR and organizationally-prescribed perfectionism were recorded at 1.000, and tolerance values stood at 1.000, indicating minimal multi-collinearity concerns since VIF values remained under the threshold of 10

and tolerance values were well above 0.2. These findings confirm the robustness of the regression estimates and maintain the statistical power of the moderation analysis, ensuring that the results reflect true relationships rather than being distorted by statistical anomalies.

The findings from the mediation evaluation. We compared a full mediation model with a partial mediation model using a chi-square difference test to find out which one was better. While the partial model does account for a direct relationship between CSR and cybersecurity activity, the full mediation model does not. The full mediation model had many excellent fit statistics, including a 256 degree of freedom with a chi-square value of 564.636, a CFI of 0.925, a TLI of 0.912, and an RMSEA of 0.055. The other model also showed strong fit statistics. A chi-square of 544.731 with 255 degrees of freedom, corresponding CFI of 0.930, TLI of 0.917, and RMSEA of 0.053 values were also shown by the partial mediation model. Both models provided a good fit to the data, since their fit indices were very similar, suggesting that there were few differences in the degrees of freedom.

There was a significant chi-square difference ($\Delta \chi^2 [1] = 19.905, p < 0.01$), which meant that the partial mediation model was supported by the chi-square difference test. This finding lends credence to the idea that CSR influences cybersecurity behavior in a two-way street, via psychological safety and occupational stress. Therefore, CSR's impact on cybersecurity behavior cannot be entirely explained by the psychological safety and job stress it induces. Except for education level ($\beta = 0.134, p < 0.05$), which suggests that the main relationships were not muddled by these demographic factors, the model did not find any significant impacts on cybersecurity behavior from control variables like tenure, gender, educational level, and job position.

In the partial mediation model, the study model confirmed Hypothesis 1 by showing a strong direct correlation between CSR and cybersecurity behavior ($\beta = 0.264, p < 0.001$). After further confirmation of the partial mediation model's superiority through the substantial coefficient in the CSR to cybersecurity behavior route, it was ultimately accepted as the final model. This conclusion underscores the importance of considering psychological safety and job stress as primary mediators of the impact of CSR on cybersecurity behavior. It also highlights the need to take into account both the direct and indirect implications on employee cybersecurity behavior when incorporating CSR activities.

In addition, the results were in line with Hypothesis 2, which demonstrated that CSR has a notable beneficial effect on psychological safety ($\beta = 0.356, p < 0.001$), and with Hypothesis 3, which showed that psychological safety significantly reduces job stress ($\beta = -0.309, p < 0.001$). A substantial detrimental effect of work stress on cybersecurity behavior was demonstrated by Hypothesis 4 ($\beta = -0.148, p < 0.01$). Table 3 and Fig. 2 highlight the results, which show that when CSR is higher, employees feel

Table 3 Results of Structural Model.					
Hypothesis	Path (Relationship)	Unstandardized Estimate	S.E.	Standardized Estimate	Supported
1	CSR -> Cybersecurity Behavior	0.373	0.088	0.264***	Yes
2	CSR -> Psychological Safety	0.308	0.059	0.356***	Yes
3	Psychological Safety-> Job Stress	-0.623	0.126	-0.309***	Yes
4	Job Stress -> Cybersecurity Behavior	-0.120	0.044	-0.148**	Yes
5	CSR × Organizationally-Prescribed Perfectionism	-0.113	0.039	-0.155**	Yes
p < 0.01, *p < 0.001. Estimate indicates standardized coefficients. S.E. means standard error. The coefficient value of the path from AI adoption to depression (H1) was in the partial mediation model which was not accepted as a final model.					

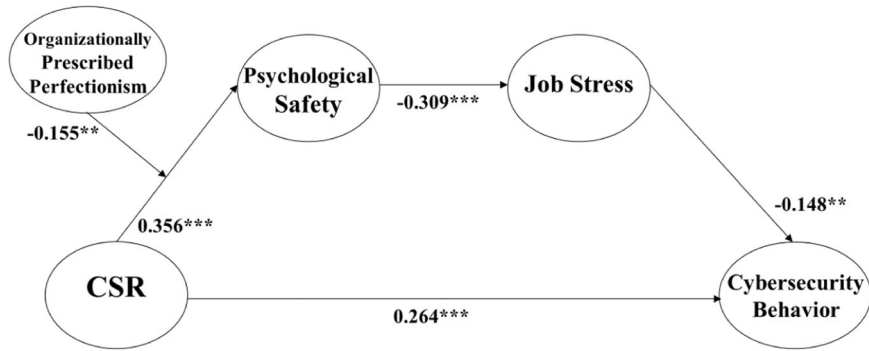


Fig. 2 Coefficient Values of our Research Model (** $p < 0.01$, *** $p < 0.001$. All values are standardized).

more psychologically safe, which lowers their levels of job stress and improves their cybersecurity behavior. To understand the beneficial psychological impacts of CSR on the workforce, it is important to address psychological safety and job stress, which play essential mediating roles between CSR and cybersecurity behavior. These findings highlight the significance of addressing these factors in sequence. Table 3 and Fig. 2 provide visual representations that help explain and convey these intricate relationships.

Bootstrapping. We used a bootstrapping methodology with a large sample size of 10,000 to validate Hypothesis 4, which states that psychological safety and job stress serve as sequential mediators between CSR and cybersecurity behavior. Shrout and Bolger (2002) suggest using large samples to improve the validity and reliability of bootstrapping results; this method is in accordance with their recommendations. To be statistically significant, the sequential mediation effect of psychological safety and occupational stress must not include zero in the 95% bias-corrected confidence interval (CI) for the average indirect effect, as defined by Shrout and Bolger (2002).

Thanks to the aforementioned high sample size, the investigation carefully looked at how psychological safety and job stress mediated the connection between CSR and cybersecurity behavior among employees. With the 95% bias-corrected CI for the average impact clearly excluding zero (95% CI = [0.004, 0.038]), verifying the validity of this indirect mediation effect, the statistical significance of the sequential mediating role of psychological safety and job stress was demonstrated without a doubt. In addition to supporting Hypothesis 5, this discovery clarifies the intricate mechanisms involved. Data on the total, indirect, and direct impacts of CSR on cybersecurity behavior are presented in Table 4. There is substantial evidence to suggest that CSR has an indirect effect on cybersecurity behavior via psychological safety and job stress. The significance of addressing the psychological underpinnings that connect CSR to cybersecurity behavior among employees is underscored by this research.

The bootstrapping method offers several advantages over traditional methods like the Baron and Kenny (1986) steps or the Sobel test (Sobel, 1982). As a nonparametric technique, bootstrapping involves repeatedly sampling from the data with replacement, generating numerous bootstrap samples, and does not presuppose normality in the distribution of the indirect effect, providing greater resilience to distributional assumptions. Additionally, this method offers a more precise estimate of the confidence interval for the indirect effect, accommodating its potentially asymmetric distribution, enhancing the accuracy of the mediation analysis (Preacher & Hayes, 2008).

Furthermore, the comprehensive breakdown in Table 4 delineates the direct, indirect, and total effects between CSR

Table 4 Direct, Indirect, and Total Effects of the Final Research Model.

Model (Hypothesis 4)	Direct Effect	Indirect Effect	Total Effect
CSR -> Psychological Safety -> Job Stress -> Cybersecurity Behavior	0.264	0.016	0.280
All values are standardized.			

and cybersecurity behavior. The direct effect quantifies the relationship after considering psychological safety and job stress's sequential mediating role, the indirect effect measures the portion attributable to the mediators, and the total effect encapsulates the aggregate influence of CSR on cybersecurity behavior, inclusive of both direct and indirect pathways. This detailed separation helps illuminate how CSR impacts employee cybersecurity behavior, underscoring psychological safety and job stress as pivotal factors in this relationship.

The findings from the moderation evaluation. Examining how organizationally-prescribed perfectionism moderates the connection between CSR and psychological safety was the major motivation for this study. We utilized a mean-centering technique to limit the hazards of multicollinearity and generated an interaction term that incorporates both organizationally-prescribed perfectionism and CSR. The potential positive benefits of CSR on psychological safety are diminished by organizationally-prescribed perfectionism, as confirmed by the statistical significance of this interaction term ($\beta = -0.155$, $p < 0.01$), which indicates that this component acts as a negative moderator. This suggests that excessive levels of organizationally-prescribed perfectionism might damage a supportive and open work environment, which in turn can reduce the good effects of CSR on employees' psychological safety.

The methodology for this moderation analysis adheres to the guidelines proposed by Aiken and West (1991), which advocate for the use of mean-centering and interaction terms to ascertain moderating influences. By mean-centering the predictor and moderator, the analysis ensures that the interaction term distinctly represents the unique variance attributable to the moderation, rather than merely echoing the main effects of the variables involved. This methodological approach not only clarifies the interpretation of the moderation results but also mitigates potential multicollinearity concerns, which could otherwise skew the results, as discussed by Cohen et al (2003). This meticulous statistical handling enables a clearer understanding of how organizationally-prescribed perfectionism can

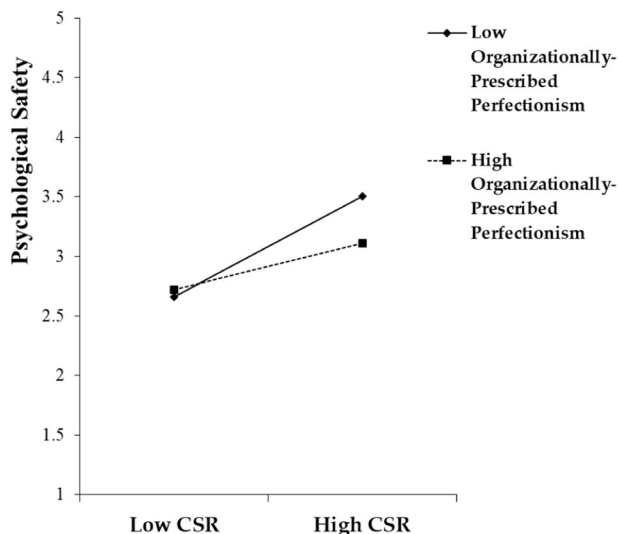


Fig. 3 Moderating Effect of Organizationally-Prescribed Perfectionism in the CSR-Psychological Safety link.

influence the influence of CSR on psychological safety within corporate settings Fig. 3.

Discussion

This study aimed to investigate the complex connections among CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and employee cybersecurity behavior. The results provide valuable insights into how CSR directly and indirectly influences cybersecurity behavior and how perfectionism moderates the influence of CSR on psychological safety.

Drawing on the JD-R model, our findings demonstrate that CSR functions as a crucial organizational resource that enhances employees' capacity for cybersecurity behavior ($\beta = 0.264$, $p < 0.001$). This significant positive relationship suggests that when organizations invest in CSR, they provide employees with valuable resources necessary for maintaining proper security practices. As the JD-R model suggests, these organizational resources help employees meet the increasing demands of cybersecurity responsibilities in today's digital workplace.

The results of our study confirm the hypothesis that CSR has a beneficial effect on the cybersecurity behavior of employees (H1). This is consistent with prior studies suggesting that CSR can foster favorable attitudes and behaviors among employees (Aguinis & Glavas, 2019; Gond et al. 2017). Specifically, our findings extend the JD-R model by demonstrating how CSR, traditionally viewed as a broad organizational initiative, can serve as a specific job resource in the cybersecurity context.

Additionally, the study found that psychological safety and job stress act as sequential mediators in the CSR-cybersecurity behavior link (H5). Drawing on COR theory, our findings reveal how CSR initiatives represent organizational resource investments that enhance psychological safety ($\beta = 0.356$, $p < 0.001$). This relationship demonstrates the process through which organizational resource provision creates psychological resources for employees.

Specifically, CSR enhances psychological safety (H2), which then reduces job stress (H3), ultimately leading to improved cybersecurity behavior (H4). This sequential process aligns with the JD-R model's proposition that job resources (psychological safety) can buffer against job demands, thereby reducing stress ($\beta = -0.309$, $p < 0.001$). Furthermore, consistent with COR theory, our results show how job stress, representing resource depletion, significantly impairs cybersecurity behavior

($\beta = -0.148$, $p < 0.01$), supporting the theory's premise about how resource loss affects protective behaviors.

The study revealed that organizationally-prescribed perfectionism acts as a moderator in the association between CSR and psychological safety (H6), providing a novel perspective on how CSR affects employee outcomes. This moderation effect can be understood through both theoretical lenses: from a JD-R perspective, perfectionism represents an additional job demand that may interfere with the resource-building capacity of CSR; from a COR theory perspective, it suggests that perfectionistic standards may impede the resource gain process initiated by CSR initiatives.

Our research makes several important theoretical contributions. First, we make significant contributions to both CSR and cybersecurity literature streams. To CSR literature, our findings extend our understanding of how CSR influences specific behavioral outcomes beyond traditional performance metrics, demonstrating its impact on critical security behaviors in the digital age. To cybersecurity literature, we identify CSR as a valuable organizational resource that enhances security behavior, expanding the scope of security management beyond conventional technical controls and policies.

Regarding the JD-R model, we extend its application to the cybersecurity context, demonstrate how CSR functions as a unique type of job resource, and show how psychological safety serves as a buffer against job stress in security behaviors. Concerning COR theory, our findings illustrate resource spiral effects in cybersecurity behavior, demonstrate the translation of organizational resources into individual psychological resources, and show how resource depletion through stress affects security behaviors.

Furthermore, by bridging these two distinct research domains, our study reveals how organizational initiatives traditionally studied in CSR literature can meaningfully contribute to cybersecurity outcomes. This integration provides novel theoretical insights into how social responsibility initiatives can enhance organizational security through psychological mechanisms, thereby advancing both fields of study.

These findings have significant implications for organizational policy and practice. First, organizations should integrate their CSR initiatives with cybersecurity objectives by incorporating security awareness into CSR training programs and using CSR communication channels for security policy dissemination. Second, organizations can leverage CSR to enhance employee engagement in cybersecurity through building psychological safety that encourages security-related communication and reducing stress-related barriers to security compliance. Third, organizations should develop integrated training programs that address both CSR and security, while establishing metrics to evaluate the impact of CSR on security behavior.

Our findings also suggest practical strategies for improving organizational security through CSR. Organizations can create feedback mechanisms that connect CSR initiatives with security outcomes, fostering a security-conscious organizational culture. Furthermore, CSR activities can be designed to promote collaborative security practices and create a supportive environment for security behavior. These approaches can help build collective responsibility for organizational security while maintaining employee well-being.

In conclusion, the current paper highlights the multifaceted effect of CSR in influencing employee cybersecurity behavior and the critical mediating and moderating factors involved. By fostering psychological safety and reducing job stress, CSR can significantly enhance cybersecurity behavior, though this effect can be mitigated by high levels of organizationally-prescribed perfectionism. These insights deepen our theoretical understanding of how organizational resources influence security behaviors

while providing practical guidance for organizations seeking to enhance their cybersecurity through CSR initiatives.

Role of CSR awareness and communication. Our additional analysis of CSR awareness provides important insights into the mechanisms through which CSR influences employee outcomes. The strong positive correlations between CSR awareness and both psychological safety ($r = 0.42$) and cybersecurity behavior ($r = 0.38$) suggest that employees' conscious understanding of their organization's CSR initiatives plays a crucial role in shaping workplace behaviors. This finding aligns with Dong et al.'s (2024) reasoned action approach, which suggests that effective CSR communication can enhance employee engagement and subsequent behavioral outcomes. The high level of CSR awareness among our respondents ($M = 3.65$, $SD = 0.78$) indicates that organizations in our sample generally succeed in communicating their CSR initiatives to employees, though there remains room for improvement.

The negative correlation between CSR awareness and job stress ($r = -0.25$) provides an interesting insight into how understanding organizational CSR initiatives might serve as a psychological buffer against workplace stressors. This buffering effect could operate through enhanced organizational identification and perceived organizational support, as suggested by previous research (Kim & Rhee, 2011). When employees are well-informed about their organization's CSR activities (72% in our sample), they may develop a stronger sense of organizational purpose and values, potentially reducing job-related stress.

Our hierarchical regression analyses revealed that CSR awareness contributes unique variance to both psychological safety ($\Delta R^2 = 0.08$) and cybersecurity behavior ($\Delta R^2 = 0.06$), beyond the effects of our original CSR measure. This finding supports Hahn et al.'s (2024) argument that employee engagement with CSR initiatives is distinct from the mere presence of such initiatives. The fact that 68% of employees reported effective CSR communication, while 70% understood how these initiatives aligned with organizational mission, suggests that organizations should focus not only on implementing CSR programs but also on ensuring effective communication and employee understanding of these initiatives.

These new findings complement and extend our original results in several ways. First, they demonstrate that the relationship between CSR and employee outcomes is more nuanced than previously understood, with awareness playing a crucial mediating role. The strong correlation between CSR awareness and our original CSR measure ($r = 0.45$) suggests these constructs are related but distinct, capturing different aspects of how employees experience and interpret organizational CSR initiatives.

Second, our findings regarding the role of CSR awareness help explain the psychological mechanisms through which CSR influences cybersecurity behavior. When employees are well-informed about their organization's CSR activities and understand how these initiatives align with organizational mission, they may be more likely to reciprocate through positive behaviors, including enhanced cybersecurity practices. This interpretation is consistent with social exchange theory and extends our understanding of how CSR influences employee behavior.

Third, the negative correlation between CSR awareness and job stress provides new insights into how CSR might influence employee well-being. Understanding organizational CSR initiatives appears to help employees better cope with workplace demands, possibly by providing a broader context for their work and strengthening their connection to organizational values.

These findings extend current theoretical understanding in several ways. First, they highlight the importance of considering

both the presence and awareness of CSR initiatives when studying their impact on employee outcomes. This dual perspective provides a more complete understanding of how CSR influences workplace behavior. Second, our results support and extend the reasoned action approach to CSR (Dong et al. 2024) by demonstrating how awareness mediates the relationship between CSR initiatives and behavioral outcomes. Third, our findings contribute to the ongoing discussion about employee-CSR tensions (Hahn et al. 2024) by showing how effective communication can help align employee perceptions with organizational CSR initiatives.

Our findings suggest several practical implications for organizations seeking to enhance the effectiveness of their CSR initiatives. First, organizations should develop comprehensive communication strategies to ensure employees are well-informed about CSR activities. The fact that 32% of employees in our sample reported less than effective CSR communication suggests room for improvement in this area. Second, organizations should focus on helping employees understand how CSR initiatives align with organizational mission and values, as this understanding appears crucial for generating positive outcomes. Third, organizations might leverage CSR awareness as a tool for reducing job stress and enhancing psychological safety, potentially through targeted communication strategies that emphasize the connection between CSR initiatives and employee well-being.

Theoretical implications. This paper can offer significant theoretical advancements in understanding the interplay between CSR and cybersecurity behavior.

Firstly, this research substantially enriches the literature on the microfoundations of CSR (Aguinis & Glavas, 2012; Gond et al. 2017; Fatima & Elbanna, 2023) by providing strong evidence of how socially responsible practices influence employee cybersecurity behavior. Previous research has mainly examined the impact of CSR on employee attitudes and behaviors such as organizational commitment, job satisfaction, and organizational citizenship behavior (Bavik et al. 2018; Fatima & Elbanna, 2023; Onkila & Sarna, 2022). However, our study emphasizes the important role of CSR in influencing cybersecurity-related behaviors. By integrating several theories, the current paper has developed a comprehensive framework explaining how CSR motivates employees to protect organizational assets and engage in secure digital practices. This novel insight significantly broadens our understanding of CSR's influence on employee behavior and emphasizes the importance of considering cybersecurity as a vital outcome in CSR studies.

Secondly, this work adds to the existing body of research on the psychological processes linking CSR and employee outcomes (Aguinis & Glavas, 2019; Fatima & Elbanna, 2023; Onkila & Sarna, 2022) through delving into the mediating roles of psychological safety and job stress. Previous research has identified mediators including organizational identification, perceived organizational support, and meaningfulness (Aguinis & Glavas, 2019; Fatima & Elbanna, 2023; Gond et al. 2017), but our findings offer a fresh perspective on how CSR affects employee cybersecurity behavior through these psychological pathways. Utilizing several theories, we show how CSR enhances psychological safety and reduces job stress, fostering a supportive environment conducive to secure digital practices. This insight extends our understanding of the intricate association between organizational factors, employee well-being, and cybersecurity behavior, underscoring the significance of psychological consequences of CSR in organizational security contexts.

Thirdly, by examining organizationally-prescribed perfectionism as a moderating factor, this research can make a pioneering

contribution to understanding the boundary conditions of CSR (Aguinis et al. 2020; Rupp & Mallory, 2015). While previous studies have explored contextual factors like industry characteristics, cultural values, and leadership styles (Aguinis & Glavas, 2012, 2019; Fatima & Elbanna, 2023; Onkila & Sarna, 2022), we highlight how employees' perfectionistic tendencies influence their responses to CSR initiatives. Integrating various theoretical perspectives, we develop a framework illustrating how the alignment between employees' perfectionistic orientations and organizational demands impacts their psychological safety, job stress, and cybersecurity behavior. This insight advances our understanding of the complex interplay between individual and organizational factors in CSR effectiveness and highlights the need to consider employees' unique characteristics in CSR studies.

Finally, our study advances theory by integrating multiple theoretical perspectives. This integration creates a comprehensive framework capturing the nuanced relationships between CSR, employee well-being, and cybersecurity behavior. By synthesizing these theoretical lenses, we offer a holistic understanding of how CSR influences employee attitudes, behaviors, and well-being, which in turn affects their cybersecurity actions. This theoretical integration enriches our comprehension of the dynamics between CSR and employee outcomes and paves the way for future research to explore these constructs in various contexts. Moreover, our framework underscores the importance of a multi-disciplinary approach to studying CSR, employee well-being, and cybersecurity, demonstrating the value of insights from organizational psychology, social psychology, and information security. This contribution has the potential to revolutionize CSR research, offering a foundation for future studies that are both theoretically rigorous and practically relevant.

Practical implications. Executives, managers, and other leaders can benefit greatly from the study's findings. First, our research provides strong evidence that CSR can be a powerful catalyst for enhancing employee cybersecurity behavior. By engaging in socially responsible practices, such as supporting employee well-being, contributing to local communities, and protecting the environment, organizations can build a strong feeling of identification and commitment among members (Bavik et al. 2018). This commitment can motivate members to perform beyond formal work duties to protect the organization's digital assets and maintain a secure work environment. Therefore, top management and leaders should prioritize developing and implementing robust CSR strategies that align with their organization's values and goals, as well as the needs and expectations of stakeholders (Aguinis & Glavas, 2019). Creating a culture of social responsibility not only enhances employee well-being but also strengthens the organization's cybersecurity posture.

Secondly, the importance of psychological safety and job stress in mediating the link between CSR and cybersecurity behavior is highlighted in our study. The importance of creating a welcoming and secure workplace where employees feel comfortable expressing their concerns, exchanging information, and seeking assistance with cybersecurity issues is highlighted by the finding. (Edmondson & Lei, 2014). Leaders and supervisors should cultivate an environment characterized by trust, respect, and open communication. This will empower employees to confidently take interpersonal risks and freely communicate their views, without the fear of facing adverse outcomes (Frazier et al. 2017). These goals can be accomplished by providing consistent feedback and acknowledgement, engaging staff in decision-making, and providing training and development opportunities that promote confidence and independence (Kahn, 1990). Additionally,

organizations should aim to reduce job stress by providing adequate resources such as technical support, user-friendly security tools, and clear cybersecurity policies and procedures (Li et al. 2019). Addressing these psychological and organizational factors can create an environment conducive to secure digital practices and employee well-being.

Thirdly, our exploration of organizationally-prescribed perfectionism as a moderating factor emphasizes the need for leaders and practitioners to consider individual differences when designing and implementing CSR initiatives and cybersecurity policies. Our findings suggest that members with a high degree of organizationally-prescribed perfectionism would be more susceptible to the harmful influences of job stress and less likely to benefit from the psychological safety benefits of CSR (Ocampo et al. 2020). Thus, organizations should aim to create a work environment sensitive to the distinct desires and characteristics of their members, recognizing that a one-size-fits-all approach would not be effective. Leaders and managers should engage in open and honest conversations with employees to understand their individual concerns, expectations, and perfectionistic tendencies, and tailor support and resources accordingly (Ozbilir et al. 2015). This may involve providing targeted training and coaching to help employees manage perfectionistic tendencies, as well as offering flexible work arrangements and stress management resources to support well-being. By adopting a personalized approach to CSR and cybersecurity, organizations have the ability to establish a more comprehensive and encouraging atmosphere that empowers all employees to flourish and make valuable contributions to the success of the firm.

Finally, the current paper highlights the significance of taking a holistic and interdisciplinary approach to promoting CSR and cybersecurity. Our findings demonstrate that these concepts are closely interconnected and that a narrow focus on any one area may not be sufficient to achieve desired outcomes (Aguinis et al. 2020). Therefore, top management and leaders should strive to break down silos and foster collaboration between different functions and departments, such as human resources, information technology, and corporate social responsibility (Glavas, 2016). This might involve establishing cross-functional teams, promoting knowledge sharing and best practice exchange, and developing integrated strategies that address the intricate connections between CSR and cybersecurity (Rupp & Mallory, 2015). Moreover, organizations ought to establish alliances with external stakeholders, including industry associations, academic institutions, and government agencies, in order to remain informed about the most recent advancements and optimal methodologies in these domains (Aguinis & Glavas, 2012; Fatima & Elbanna, 2023; Onkila & Sarna, 2022). By adopting a collaborative and multidisciplinary approach, organizations can develop more comprehensive and effective strategies for promoting CSR, employee well-being, and cybersecurity, ultimately contributing to long-term success and sustainability.

Limitations and suggestions for future research. While acknowledging the study's limitations and offering suggestions for future research is essential, the insights it offers regarding CSR and cybersecurity behavior are invaluable. First, although the current research employed a 4-wave time-lagged design, it does not qualify as longitudinal in the strictest sense. Consequently, our data restricts our capacity to demonstrate causality between our research variables (Fatima & Elbanna, 2023; Onkila & Sarna, 2022). Despite the robust theoretical framework and empirical support for the proposed relationships, future studies should adopt true longitudinal designs to better capture the temporal dynamics and causal mechanisms underlying CSR's impact on

employee cybersecurity behavior. This could involve collecting data in a strictly longitudinal manner and utilizing advanced statistical techniques, such as latent growth curve modeling, to examine how changes in CSR initiatives and employee perceptions of psychological safety and job stress influence cybersecurity behavior over time.

Second, the narrow scope of our study, which concentrates on a single cultural context, may restrict the applicability of our findings to different environments. (Aguinis et al. 2020). Although our sample includes employees from various industries and organizational levels, it is essential to recognize that CSR initiatives' effectiveness and employee responses may vary across different cultural and institutional contexts (Rupp & Mallory, 2015). Subsequent investigations should duplicate and expand upon our discoveries in various cultural contexts, such as collectivistic versus individualistic cultures, to explore how cultural values and norms shape the relationships between CSR, employee well-being, and cybersecurity behavior (Fatima & Elbanna, 2023). This could involve conducting cross-cultural comparative studies or examining the moderating roles of cultural aspects, such as power distance or uncertainty avoidance, on the proposed relationships (Glavas, 2016).

Third, the reliance on self-reported measures in our study may introduce common method bias and social desirability effects (Podsakoff et al. 2003). Although we performed several statistical remedies to mitigate these concerns, such as ensuring participant anonymity and using validated scales, future study should incorporate the utilization of several sources of data and objective measurements in order to improve the accuracy and reliability of our findings (Aguinis & Glavas, 2019). For instance, researchers could gather data on CSR initiatives from company reports or third-party assessments, measure psychological safety and job stress using physiological indicators or peer ratings, and assess cybersecurity behavior through behavioral observations or system logs. By triangulating data from multiple sources and methods, future studies can offer a more comprehensive understanding of the intricate relationships between CSR and cybersecurity behavior. Additionally, future research could employ system-generated security compliance data, integrate third-party security audit results, and include supervisor evaluations of employee cybersecurity behavior. These objective measures would help validate the relationships identified through self-reported measures and strengthen the empirical evidence for the CSR-cybersecurity behavior link. Furthermore, researchers might benefit from employing experimental designs or longitudinal studies with behavioral tracking to establish stronger causal relationships and minimize common method bias concerns (Crossler et al. 2013). Such methodological diversity would enhance the robustness of findings while providing more nuanced insights into how CSR influences employee security behaviors.

Fourth, while our study examines the sequential mediation effect of psychological safety and job stress, there may be other important mechanisms that explain the CSR-cybersecurity behavior link. Further investigation should be conducted in order to examine other mediators, such as organizational identification, perceived organizational support, or ethical climate. In order to acquire a more intricate comprehension of the psychological processes that underlie this association (Fatima & Elbanna, 2023; Gond et al. 2017; Onkila & Sarna, 2022). Moreover, future studies could investigate potential boundary conditions or moderators that may affect the strength or direction of the proposed links, such as leadership styles, organizational culture, or individual differences in values or personality traits (Ozbilir et al. 2015). Via investigating a more diverse range of mediating and moderating variables, future works may develop a more comprehensive and context-specific model of the impact of CSR on employee cybersecurity behavior.

Fifth, the current research focuses on the role of organizationally-prescribed perfectionism as a moderator, but future research should consider other types of perfectionism, such as self-oriented or other-oriented perfectionism, and their potential impact on the relationships between CSR, employee well-being, and cybersecurity behavior (Ocampo et al. 2020). Additionally, future studies could explore how different aspects of perfectionism, including perfectionistic strivings or perfectionistic concerns, can differentially influence employee responses to CSR initiatives and their subsequent cybersecurity behavior. By adopting a more nuanced and multidimensional approach to studying perfectionism in the workplace, future works could provide light on how companies can customize their CSR and cybersecurity plans to cater to the specific requirements and traits of their workers.

Sixth, while our additional Time 5 survey examining CSR awareness achieved a high response rate (94%), the eight-week gap between Time 4 and Time 5 might not fully capture the dynamic nature of how CSR awareness develops and influences employee behavior. Our measure of CSR awareness, though demonstrating strong psychometric properties, focuses primarily on general awareness and communication effectiveness. Future research might benefit from developing more nuanced measures that capture different dimensions of CSR awareness.

Seventh, building on Dong et al.'s (2024) work on CSR communication and Hahn et al.'s (2024) framework of employee engagement, future studies could investigate different approaches to CSR communication and their relative effectiveness. This might include examining how various communication channels and strategies influence employee awareness and subsequent behavioral outcomes. Also, researchers could explore how CSR awareness interacts with other organizational factors to influence cybersecurity behavior. This could include investigating the role of leadership styles, organizational culture, and individual differences in shaping how employees interpret and respond to CSR initiatives. Understanding these interaction effects would provide valuable insights for organizations seeking to enhance the effectiveness of their CSR and cybersecurity programs.

Finally, while our work provides significant practical consequences for companies, future works should focus on developing and testing specific interventions and strategies that can help organizations effectively implement CSR initiatives and promote employee cybersecurity behavior. This could involve conducting action research or field experiments to evaluate the effectiveness of different training programs, communication strategies, or leadership practices in fostering a culture of social responsibility and cybersecurity (Aguinis & Glavas, 2012; Li et al. 2019). Moreover, future studies could explore how organizations can design and perform CSR activities which are more closely aligned with their cybersecurity goals and objectives, such as promoting digital literacy, supporting cybersecurity education and research, or collaborating with stakeholders to address emerging cyber threats. By bridging the gap between research and practice, future studies can offer actionable insights and evidence-based recommendations that can help organizations navigate the complex challenges of promoting CSR, employee well-being, and cybersecurity in the digital age.

Conclusion

By looking at the links between CSR, organizationally-prescribed perfectionism, psychological safety, work stress, and cybersecurity behavior, this study adds to the growing body of literature on CSR and its effects on employee outcomes. Understanding the direct and indirect effects of CSR on cybersecurity behavior is greatly enhanced by the results. More than that, they explain how CSR and psychological safety are related, and how organizationally-prescribed perfectionists moderate this relationship.

The complex relationships between CSR, organizationally-prescribed perfectionism, psychological safety, job stress, and cybersecurity behavior among employees can be better understood with the help of this research. The findings highlight the importance of considering both the direct and indirect effects of CSR on employee outcomes, as well as the role of individual differences in shaping employee responses to CSR activities. Through dealing with the factors, organizations can develop effective CSR strategies and interventions that foster a secure and psychologically safe work environment, ultimately promoting employee well-being and cybersecurity behavior amid increasing digital threats and organizational demands.

Additional research and practical applications in the fields of CSR and cybersecurity can be informed by the results of this study, as firms grapple with the difficulties posed by the digital era. By acknowledging the interdependence of these variables and embracing a comprehensive strategy to implementing CSR, firms can establish a conducive work environment that fosters employee development, adaptability, and stability, so eventually enhancing their long-term prosperity and durability.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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References

- Aguinis H, Glavas A (2012) What we know and don't know about corporate social responsibility: A review and research agenda. *J Manag* 38(4):932–968
- Aguinis H, Glavas A (2019) On corporate social responsibility, sensemaking, and the search for meaningfulness through work. *J Manag* 45(3):1057–1086
- Aguinis H, Villamor I, Gabriel KP (2020) Understanding employee responses to COVID-19: A behavioral corporate social responsibility perspective. *Manag Res: J Iberoam Acad Manag* 18(4):421–438
- Aiken LS, West SG (1991) Multiple regression: Testing and interpreting interactions. Sage Publications, Inc
- Albarracín D, Shavitt S (2018) Attitudes and attitude change. *Annu Rev Psychol* 69:299–327
- Alsharida RA, Al-rimy BAS, Al-Emran M, Zainal A (2023) A systematic review of multi perspectives on human cybersecurity behavior. *Technology in Society*, 102258
- Anderson JC, Gerbing DW (1988) Structural equation modeling in practice: A review and recommended two-step approach. *Psychol Bull* 103(3):411–423
- Anwar M, He W, Ash I, Yuan X, Li L, Xu L (2017) Gender difference and employees' cybersecurity behaviors. *Comput Hum Behav* 69:437–443
- Baer M, Frese M (2003) Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. *J Organ Behav* 24(1):45–68
- Bakker AB, Demerouti E (2007) The job demands-resources model: State of the art. *J Manag Psychol* 22(3):309–328
- Bakker AB, Demerouti E (2014) Job demands-resources theory. In PY Chen & CL Cooper (Eds.), *Work and wellbeing: Wellbeing: A complete reference guide* (pp. 37–64). Wiley-Blackwell
- Bakker AB, Demerouti E (2017) Job demands-resources theory: Taking stock and looking forward. *J Occup Health Psychol* 22(3):273–285
- Bakker AB, Demerouti E, Sanz-Vergel AI (2014) Burnout and work engagement: The JD-R approach. *Annu Rev Organ Psychol Organ Behav* 1(1):389–411
- Barclay D, Higgins C, Thompson R (1995) The Partial Least Squares (PLS) approach to casual modeling: Personal computer adoption and use as an illustration. *Technology Studies*, 2, 285–309. *J Personal Soc Psychol* 50:1173–1182
- Baron RM, Kenny DA (1986) The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J Personal Soc Psychol* 51(6):1173–1182
- Bavik YL, Tang PM, Shao R, Lam LW (2018) Ethical leadership and employee knowledge sharing: Exploring dual-mediation paths. *Leadersh Q* 29(2):322–332
- Brace N, Kemp R, Snelgar R (2003) A guide to data analysis using SPSS for windows. Palgrave Macmillan, New York
- Bulgurcu B, Cavusoglu H, Benbasat I (2010) Information security policy compliance: An empirical study of rationality-based beliefs and information security awareness. *MIS Q* 34(3):523–548
- Caesens G, Nguyen N, Stinglhamer F (2020) Abusive supervision and organizational dehumanization. *J Bus Psychol* 35(5):709–728
- Carmeli A, Gittell JH (2009) High-quality relationships, psychological safety, and learning from failures in work organizations. *J Organ Behav* 30(6):709–729
- Carroll AB (2016) Carroll's pyramid of CSR: Taking another look. *Int J Corp Soc Responsib* 1(1):1–8
- Chen H, Liu M, Lyu T (2022) Understanding employees' information security-related stress and policy compliance intention: the roles of information security fatigue and psychological capital. *Inf Comput Secur* 30(5):751–770
- Chen L, Xie Z, Zhen J, Dong K (2022) The impact of challenge information security stress on information security policy compliance: The mediating roles of emotions. *Psychol Res Behav Manage* 1177–1191
- Cohen S, Doyle WJ, Turner R, Alper CM, Skoner DP (2003) Sociability and susceptibility to the common cold. *Psychol Sci* 14(5): 389–395
- Crawford ER, LePine JA, Rich BL (2010) Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *J Appl Psychol* 95(5):834–848
- Crossler RE, Johnston AC, Lowry PB, Hu Q, Warkentin M, Baskerville R (2013) Future directions for behavioral information security research. *Comput Secur* 32:90–101
- Cybersecurity Ventures (2020) Cybercrime to cost the world \$10.5 trillion annually by 2025. <https://cybersecurityventures.com/cybercrime-damage-costs-10-trillion-by-2025/>
- D'Arcy J, Herath T, Shoss MK (2014) Understanding employee responses to stressful information security requirements: A coping perspective. *J Manag Inf Syst* 31(2):285–318
- De Roeck K, Maon F (2018) Building the theoretical puzzle of employees' reactions to corporate social responsibility: An integrative conceptual framework and research agenda. *J Bus Ethics* 149(3):609–625
- DeJoy DM, Wilson MG, Vandenberg RJ, McGrath-Higgins AL, Griffin-Blake CS (2010) Assessing the impact of healthy work organization intervention. *J Occup Organ Psychol* 83(1):139–165
- Deloitte (2020) The Deloitte Global Millennial Survey 2020. <https://www2.deloitte.com/global/en/pages/about-deloitte/articles/millennialsurvey.html>
- Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB (2001) The job demands-resources model of burnout. *J Appl Psychol* 86(3):499–512
- Demerouti E, Bakker AB, Xanthopoulou D (2019) Job demands-resources theory and the role of individual cognitive and behavioral strategies. In T Taris, M Peeters, & H De Witte (Eds.), *The fun and frustration of modern working life: Contributions from an occupational health psychology perspective* (pp. 94–104). Pelckmans Pro
- Dong X, Jiang L, Li W, Chen C, Gan Y, Xia J, Qin X (2024) Let's talk about AI: talking about AI is positively associated with AI crafting. *Asia Pac J Manag* 1–32
- Duhigg, C (2016). What Google learned from its quest to build the perfect team. *The New York Times Magazine*. <https://www.nytimes.com/2016/02/28/magazine/what-google-learned-from-its-quest-to-build-the-perfect-team.html>
- Edmondson AC (1999) Psychological safety and learning behavior in work teams. *Adm Sci Q* 44(2):350–383
- Edmondson AC, Lei Z (2014) Psychological safety: The history, renaissance, and future of an interpersonal construct. *Annu Rev Organ Psychol Organ Behav* 1(1):23–43
- Edwards JR, Caplan RD, Van Harrison R (1998) Person-environment fit theory: Conceptual foundations, empirical evidence, and directions for future research. In CL Cooper (Ed.), *Theories of organizational stress* (pp. 28–67). Oxford University Press
- El Akremi A, Gond JP, Swaen V, De Roeck K, Igalens J (2018) How do employees perceive corporate responsibility? Development and validation of a multi-dimensional corporate stakeholder responsibility scale. *J Manag* 44(2):619–657
- Farooq O, Payaud M, Merunka D, Valette-Florence P (2014) The impact of corporate social responsibility on organizational commitment: Exploring multiple mediation mechanisms. *J Bus Ethics* 125(4):563–580
- Fatima T, Elbanna S (2023) Corporate social responsibility (CSR) implementation: A review and a research agenda towards an integrative framework. *J Bus Ethics* 183(1):105–121
- Frazier ML, Fainshmidt S, Klinger RL, Pezeshkan A, Vracheva V (2017) Psychological safety: A meta-analytic review and extension. *Pers Psychol* 70(1):113–165
- Ganster DC, Rosen CC (2013) Work stress and employee health: A multi-disciplinary review. *J Manag* 39(5):1085–1122
- Ge Y (2020) Psychological safety, employee voice, and work engagement. *Soc Behav Personality: Int J* 48(3):1–7

- Glavas A (2016) Corporate social responsibility and organizational psychology: An integrative review. *Front Psychol* 7:144
- Goh J, Pfeffer J, Zenios SA (2015) The relationship between workplace stressors and mortality and health costs in the United States. *Manag Sci* 62(2):608–628
- Gond JP, El Akremi A, Swaen V, Babu N (2017) The psychological micro-foundations of corporate social responsibility: A person-centric systematic review. *J Organ Behav* 38(2):225–246
- Guyot JJ, Fabrigar LR (2015) Attitudes and behavior. In JD Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., pp. 183–189). Elsevier
- Hahn S, Kroehne U, Merk S (2024) Improving and analyzing open-ended survey responses: A case study linking psychological theories and analysis approaches for text data. *Z fur Psychol* 232(3):171
- Halbesleben JR, Neveu JP, Paustian-Underdahl SC, Westman M (2014) Getting to the “COR”: Understanding the role of resources in conservation of resources theory. *J Manag* 40(5):1334–1364
- Hassard J, Teoh KR, Visockaite G, Dewe P, Cox T (2018) The cost of work-related stress to society: A systematic review. *J Occup Health Psychol* 23(1):1–17
- Hewett R, Liefoghe A, Visockaite G, Roongremsuke S (2018) Bullying at work: Cognitive appraisal of negative acts, coping, wellbeing, and performance. *J Occup Health Psychol* 23(1):71–84
- Hewitt PL, Flett GL (1991) Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *J Personal Soc Psychol* 60(3):456–470
- Hobfoll SE (1989) Conservation of resources: A new attempt at conceptualizing stress. *Am Psychol* 44(3):513–524
- Hobfoll SE, Halbesleben J, Neveu JP, Westman M (2018) Conservation of resources in the organizational context: The reality of resources and their consequences. *Annu Rev Organ Psychol Organ Behav* 5:103–128
- Ifinedo P (2012) Understanding information systems security policy compliance: An integration of the theory of planned behavior and the protection motivation theory. *Comput Secur* 31(1):83–95
- Ifinedo P (2014) Information systems security policy compliance: An empirical study of the effects of socialisation, influence, and cognition. *Inf Manag* 51(1):69–79
- Islam T, Ahmed I, Ali G, Sadiq T (2016) Behavioral and psychological consequences of corporate social responsibility: need of the time. *Soc Responsib J* 12(2):307–320
- Jones DA, Newman A, Shao R, Cooke FL (2019) Advances in employee-focused micro-level research on corporate social responsibility: Situating new contributions within the current state of the literature. *J Bus Ethics* 157(2):293–302
- Kahn WA (1990) Psychological conditions of personal engagement and disengagement at work. *Acad Manag J* 33(4):692–724
- Kannelonning K, Katsikas SK (2023) A systematic literature review of how cybersecurity-related behavior has been assessed. *Inf Comput Secur* 31(4):463–477
- Kark R, Carmeli A (2009) Alive and creating: The mediating role of vitality and aliveness in the relationship between psychological safety and creative work involvement. *J Organ Behav* 30(6):785–804
- Kim JN, Rhee Y (2011) Strategic thinking about employee communication behavior (ECB) in public relations: Testing the models of megaphoning and scouting effects in Korea. *J Public Relat Res* 23(3):243–268
- Kim BJ, Kim MJ, Kim TH (2021a) “The power of ethical leadership”: The influence of corporate social responsibility on creativity, the mediating function of psychological safety, and the moderating role of ethical leadership. *Int J Environ Res Public Health* 18(6):2968
- Kim BJ, Nurunnabi M, Kim TH, Jung SY (2019a) Does a good firm breed good organizational citizens? The moderating role of perspective taking. *Int J Environ Res Public Health* 16(1):161
- Kim BJ, Nurunnabi M, Kim TH, Jung SY (2018) The influence of corporate social responsibility on organizational commitment: The sequential mediating effect of meaningfulness of work and perceived organizational support. *Sustainability* 10(7):2208
- Kim BJ, Park S, Kim TH (2019b) The effect of transformational leadership on team creativity: Sequential mediating effect of employee’s psychological safety and creativity. *Asian J Technol Innov* 27(1):90–107
- Koslowsky M (2018) Job stress and burnout. In A Ariel & N Ronel (Eds.), *The Cambridge Handbook of International Prevention Science* (pp. 385–398). Cambridge University Press
- Lazarus RS, Folkman S (1984) *Stress, appraisal, and coping*. Springer
- Landers RN, Behrend TS (2015) An inconvenient truth: Arbitrary distinctions between organizational, Mechanical Turk, and other convenience samples. *Ind Organ Psychol* 8(2):142–164
- Li L, He W, Xu L, Ash I, Anwar M, Yuan X (2019) Investigating the impact of cybersecurity policy awareness on employees’ cybersecurity behavior. *Int J Inf Manag* 45:13–24
- Motowidlo SJ, Packard JS, Manning MR (1986) Occupational stress: its causes and consequences for job performance. *J Appl Psychol* 71(4):618
- Muthukrishna M, Henrich J (2019) A problem in theory. *Nat Hum Behav* 3(3):221–229
- Nadeem K, Wong SI, Za S, Venditti M (2024) Digital transformation and industry 4.0 employees: Empirical evidence from top digital nations. *Technol Soc* 76:102434
- Newman A, Donohue R, Eva N (2017) Psychological safety: A systematic review of the literature. *Hum Resour Manag Rev* 27(3):521–535
- Newton CJ, Mazur AK (2016) Value congruence and job-related attitudes in a nonprofit organization: a competing values approach. *Int J Hum Resour Manag* 27(10):1013–1033
- Ocampo ACG, Wang L, Kiazad K, Restubog SLD, Ashkanasy NM (2020) The relentless pursuit of perfectionism: A review of perfectionism in the workplace and an agenda for future research. *J Organ Behav* 41(2):144–168
- Onkila T, Sarna B (2022) A systematic literature review on employee relations with CSR: State of art and future research agenda. *Corp Soc Responsib Environ Manag* 29(2):435–447
- Ozbilir T, Day A, Catano VM (2015) Perfectionism at work: An investigation of adaptive and maladaptive perfectionism in the workplace among Canadian and Turkish employees. *Appl Psychol* 64(1):252–280
- Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP (2003) Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J Appl Psychol* 88(5):879–903
- Podsakoff PM, MacKenzie SB, Podsakoff NP (2012) Sources of method bias in social science research and recommendations on how to control it. *Annu Rev Psychol* 63:539–569
- Pollini A, Callari TC, Tedeschi A, Ruscio D, Save L, Chiarugi F, Guerri D (2022) Leveraging human factors in cybersecurity: an integrated methodological approach. *Cognition, Technol Work* 24(2):371–390
- Possey C, Roberts TL, Lowry PB (2015) The impact of organizational commitment on insiders’ motivation to protect organizational information assets. *J Manag Inf Syst* 32(4):179–214
- Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods* 40(3):879–891
- PwC (2021) Consumer intelligence series: ESG and consumer behavior. <https://www.pwc.com/us/en/services/consulting/library/consumer-intelligence-series/consumer-and-employee-esg-expectations.html>
- Rogers RW (1975) A protection motivation theory of fear appeals and attitude change. *J Psychol* 91(1):93–114
- Rupp DE, Mallory DB (2015) Corporate social responsibility: Psychological, person-centric, and progressing. *Annu Rev Organ Psychol Organ Behav* 2(1):211–236
- Salancik GR, Pfeffer J (1978) A social information processing approach to job attitudes and task design. *Adm Sci Q* 23(2):224–253
- Schaufeli WB, Taris TW (2014) A critical review of the job demands-resources model: Implications for improving work and health. In GF Bauer & O Hämmig (Eds.), *Bridging occupational, organizational and public health: A transdisciplinary approach* (pp. 43–68). Springer
- Shaikh FA, Siponen M (2023) Information security risk assessments following cybersecurity breaches: The mediating role of top management attention to cybersecurity. *Comput Secur* 124:102974
- Sherry SB, Stoeber J, Ramasubbu C (2016) Perfectionism explains variance in self-defeating behaviors beyond self-criticism: Evidence from a cross-national sample. *Personal Individ Differ* 95:196–199
- Shrout PE, Bolger N (2002) Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychol Methods* 7(4):422–445
- Singh T, Johnston AC, D’Arcy J, Harms PD (2023) Stress in the cybersecurity profession: a systematic review of related literature and opportunities for future research. *Organ Cybersec J: Pract, Process People* 3(2):100–126
- Stoeber J, Rennert D (2008) Perfectionism in school teachers: Relations with stress appraisals, coping styles, and burnout. *Anxiety, stress, and coping* 21(1):37–53
- Sobel ME (1982) Asymptotic confidence intervals for indirect effects in structural equation models. *Sociol Methodol* 13:290–312
- Turker D (2009) Measuring corporate social responsibility: A scale development study. *J Bus Ethics* 85:411–427
- Velte P (2021) Meta-analyses on corporate social responsibility (CSR): a literature review. *Manag Rev Q* 72(3):627–675
- Xia L, Wei J, Gao S, Ma B (2020) Promoting corporate sustainability through sustainable resource management: A hybrid decision-making approach incorporating social media data. *Environ Impact Assess Rev* 85:106459

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Author contributions

Dr. Byung-jik Kim contributed by writing the original draft of the manuscript and participating in the conceptualization, data collection, formal analysis, and methodology. Dr. Julak Lee contributed to the conceptualization, analysis, revision, and editing of the manuscript. All authors contributed to the writing of the final manuscript and have read and agreed to the published version of the manuscript. All members of this research team contributed to the management or administration of this paper.

Competing interests

The authors declare no competing interests.

Ethical approval

The survey conducted in this study adhered to the standards outlined in the Declaration of Helsinki. The Yonsei University Institutional Review Board granted ethical approval.

Informed consent

Obtained. Every participant was provided with information about the objective and extent of this study, as well as the intended utilization of the data. The respondents willingly and freely participated in the study. Their identities were kept confidential, and their involvement was optional. Prior to participating in the survey, all subjects included in the study provided informed consent. Informed consent was obtained from March 2023 to April 2023 through the website of the research company (Macromil Embrain). The scope of the consent covered participation, data use, and consent to publish. Online explanatory statement and documents related to exemption from written consent. Since the explanatory statement requires consent three times, it was submitted on the first, second, and third questionnaires. By default, written consent was waived. The reason for this is as follows. This survey was conducted through Macromil Embrain, a research company that has the largest panel in Korea (25 years of experience in the industry). Individuals belonging to the panel of Macromil Embrain registered in the company's survey response system and agreed to provide their information and survey content. Then, they logged in to the system and responded to the survey. At this time, the research company announced the contents of the researcher's survey, and panels interested in the survey participated in the survey. Alternatively, the research company asked those who were qualified to participate in the survey (e.g., office workers at a domestic company) via e-mail or text message about their intention to participate in the survey. This process was conducted entirely online, and it was practically impossible to obtain the consent of the research subjects because the researcher did not know which panel would respond to the questionnaire. Sufficient voluntary participation in research was ensured, and explanations regarding the guarantee of withdrawal and suspension of participation were supervised by the aforementioned research company. A research company manages this company's website by asking for consent when an individual signs up and registers.

When a person signs up for this company's service as a panel, these matters are explained in detail and consent is obtained. Only those who gave their consent participated in the survey. The condition for selecting study subjects was that they must have been adult employees working for domestic companies. If participants were adult employees working for a domestic company, there were no special conditions such as regular or non-regular workers. People excluded from the study were those who were not currently working or who did not have the intellectual ability to understand and respond appropriately to the questionnaire. Also, people with limited ability to give consent for research or those who were vulnerable were not included as research subjects. Only those panels who had voluntarily registered to participate in the survey with the research company (Macromil Embrain) took part in the survey. In particular, when issuing a recruitment notice, the general subject and risks of the study were noted, and personal privacy was ensured during recruitment. Steps were taken to ensure the protection and confidentiality of participants. We did not include vulnerable research subjects. Vulnerability could be judged voluntarily by survey respondents. In addition, only those who met the research company's criteria (mentioned above) could participate in the survey. The process and contents of the second and third surveys were the same as in the first survey.

Additional information

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