

# Cross-domain online vigilance, boundary management and stress among knowledge workers



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**Purpose:** High levels of online media use and permanent connectedness are common features of contemporary life in the developed world. In recent studies, the concept of online vigilance has been adopted to describe individuals' chronic attentional orientation towards and engagement with their online spheres. The present study extends this notion by investigating its role in relation to stress and boundary management.

**Design/methodology/approach:** A sample of 299 knowledge workers completed an online survey concerning the role of cross-domain online vigilance in the blurring of work-personal boundaries and the potential impact this may have on perceived stress.

**Findings/results:** Contrary to extant evidence, the findings of this study indicate that cross-domain online vigilance does not predict stress, neither on its own nor when interacting with individuals' domain segmentation preferences. However, the findings indicate that younger knowledge workers, more than their older colleagues, have trouble disconnecting from their personal online spheres while working.

**Practical implications:** Work communication policies and norms should enable workers to psychologically disconnect from work during non-working hours and should be sensitive to the differences in personal preferences for boundary segmentation. Constant psychological connection to personal online communication may impact performance among younger knowledge workers.

**Originality/value:** The present study is the first to consider the notion of online vigilance in relation to boundary management and stress among knowledge workers. The findings are particularly relevant given the increased blurring of work-personal boundaries that results from organisations adopting work-from-anywhere policies following the COVID-19 pandemic.

**Keywords:** online vigilance; boundary management; boundary blurring; perceived stress; knowledge workers; segmentation preferences.

## Introduction

Over the past decade, a rapid increase in smartphone ownership, coupled with ubiquitous internet access has engendered high levels of online media consumption across all contexts of life. While the utility of mobile computing devices and the broad range of applications they enable are key drivers of this trend, many scholars have noted that their habit-forming nature, woven into the design of many modern-day smartphone applications, is also an important factor (Eyal, 2014; Meier, 2021; Vanden Abeele et al., 2018). One of the salient consequences of these technological and behavioural developments has been the cultivation of permanently online or always-on mental predispositions among many users (Vorderer et al., 2016) and the emergence of norms that require individuals to be always available for online communication (Ling, 2017). In recent studies (Johannes et al., 2020; Klimmt et al., 2018; Reinecke et al., 2018), the term 'online vigilance' has been adopted to describe a constant cognitive orientation towards the online sphere characterised by the prioritisation of online communication-related activities over other (offline) behaviours.

An important consequence of permanent online connectedness is that it affords individuals the ability to cognitively switch between different life domains (e.g. work, family, personal, etc.) without changing their physical location. Accordingly, the boundaries between these domains, which may traditionally have been imposed by various forms of physical and/or temporal separation, are becoming increasingly blurred (Chen & Karahanna, 2014; Vorderer et al., 2016; Yang et al., 2019). This is particularly relevant against the backdrop of lockdown measures

instituted to curb the spread of COVID-19 in 2020 and 2021. Because of these measures, many workers were forced to work from their homes, leading to a range of challenges for the separation of their personal and work domains. The notion of boundary management, extending from *Boundary Theory* (Zerubavel, 1991), refers to the way a person demarcates specific aspects of their life to simplify and order their environment (Ashforth et al., 2000). Research suggests that, while some individuals segment life domains by imposing strict boundaries between them, others are less strict and choose to integrate different domains (Kossek et al., 2012; Kreiner, 2006; Leduc et al., 2016). These personal preferences play an important role in determining individuals' boundary management strategies (Leduc et al., 2016; Nippert-Eng, 1996).

Given the expanding affordances of online communication media and their centrality in both the personal and work domains, the potential impact of permanent connectedness on the psychological wellbeing of individuals has emerged as an important research domain (Freytag et al., 2021; Johannes et al., 2020, 2018; Meier, 2021). The present study advances knowledge in this domain by investigating the interaction between two forms of domain-specific online vigilance and work-personal boundary preferences among knowledge workers and the associations between these constructs and perceived stress.

## Online vigilance

Reinecke et al. (2018, p. 2) argue that smartphone users 'have developed specific routines and cognitive structures concerning their mobile online device(s), their communication relationships, and the role of receiving and sending information in the course of their daily lives'. However, not all smartphone users display the same level of involvement with their online spheres. To describe individual differences in such cognitive involvement, Reinecke et al. (2018) propose the term *online vigilance* and define three aspects that constitute it. Firstly, the term *salience* refers to a cognitive orientation towards online events and content. In addition to being physically connected to their online spheres, this dimension of online vigilance emphasises users' psychological connectedness. Secondly, *monitoring* refers to the individual's chronic attention to and monitoring of cues which signify events in their online spheres and, thirdly, *reactibility* describes a disposition to prioritise online communication over other ongoing activities. Consequently, individuals displaying high levels of online vigilance are theorised to think more frequently and intensively about their online spheres, constantly monitor their online communication environments and interrupt their ongoing activities to react to online communication cues.

While online vigilance may seem to align with the notion of 'Internet addiction' as a pathological condition, Reinecke et al. (2018, p. 7) argue that it 'represents a much more mundane form of involvement with the online environment that does not necessarily impair individual functioning and

mental health'. Notwithstanding contemporary debates about the existence and nature of behavioural addictions involving digital media (Kardefelt-Winther et al., 2017; Satchell et al., 2021) and concerns with the measurement of such phenomena (Abendroth et al., 2020; Satchell et al., 2021), studies indicate that only a small proportion of the general population exhibit pathological forms of media use (Muller et al., 2014). In contrast, Reinecke et al. (2018, p. 8) propose that online vigilance is 'a common phenomenon that affects large numbers of Internet users'.

In addition to media use behaviour, personal factors play an important role in the development of online vigilance. However, only a limited number of studies have investigated the relations between various personal characteristics (e.g. trait rumination, identity distress and the fear of missing out) and online vigilance (Le Roux & Parry, 2022; Reinecke et al., 2018; Schneider & Hitzfeld, 2021). Le Roux and Parry (2022), for example, found that, while self-reported media use behaviours (daily smartphone use, social media use and media multitasking) positively predict online vigilance, the collective effect of these behaviours is almost negligible. However, when considered in combination with personal factors like identity distress and trait rumination, a moderate effect is observable. It is likely, therefore, that online vigilance emerges as the result of the complex interplay between individual characteristics, technological features and affordances and situational circumstances (Parry & Le Roux, 2020).

While there is, at this point, little evidence which describes the role of online vigilance in individual wellbeing (cf. Freytag et al., 2021; Johannes et al., 2020, 2018), Reinecke et al. (2018) propose that online vigilance could be perceived as stressful in situations where salience presents as constant thought interruption (Reinecke et al., 2018). Freytag et al. (2021, p. 2), accordingly, argue that a culture of permanent connectedness potentially plays an important role in the development of stress.

## Boundary management

Edwards and Rothbard (2000) propose that individuals tend to psychologically compartmentalise their lives according to various roles. Such demarcation is not only based on place and time but also on the different social roles that the individual fulfils. The compartmentalisation of identities into roles is partly enabled by physical barriers but also by mental barriers (Nippert-Eng, 1996). However, Desrochers and Sargent (2004) warn that one should not view these compartments as separate spheres but rather as interdependent domains in different categories. This distinction emphasises the interconnectedness between life domains and the complexity of defining their interaction. It follows that domains may be better described by the interface (or boundary) that separates them than by their content (Matthews et al., 2010).

There is broad agreement among scholars that individuals display a preference for the management of domain boundaries. This preference can be described as a continuum

ranging from domain integration to domain segmentation and has been studied extensively in the context of work-home boundary management (Kossek et al., 2012; Kreiner, 2006; Leduc et al., 2016; Nippert-Eng, 1996). Work-home balance can be defined as the 'satisfaction and good functioning at work and at home, with a minimum of role conflict' (Clark, 2000, p. 751), while role conflict, in this context, refers to the inter-role conflict which occurs when an individual's participation in work complicates their participation in non-work or personal activities (Chen et al., 2009). Some individuals prefer to integrate domains to achieve a sense of balance, while others experience such integration as overwhelming and taxing because it often entails expectations for constant availability across multiple domains (Derks et al., 2015). These preferences might be influenced by the degree of alignment between life domains in terms of general life goals (Stoll et al., 2020), as well as the individual's level of vocational interest (Nye et al., 2017).

In addition to personal preferences, the flexibility or permeability of roles impacts boundary management possibilities. Flexibility refers to the extent to which duties of a particular role can be performed outside the usual 'fencing' of that role (Matthews et al., 2010, p. 448). High role flexibility implies that tasks associated with a specific role (e.g. work-related tasks) can be performed outside of a specific setting (time and place) dedicated to that role (e.g. the office). Permeability, in turn, refers to 'the degree to which a role allows one to be physically located in the role's domain but psychologically and/or behaviourally involved in another role' (Ashforth et al., 2000, p. 474). For example, high role permeability would enable a worker to engage in personal tasks while in the office environment. Flexibility and permeability have been shown to predict the degree of role blending or blurring that individuals experience (Clark, 2000).

### Domain-specific online vigilance and boundary blurring

The notion of online vigilance and its measurement, as proposed by Reinecke et al. (2018), frames the individual's online sphere in a domain (or role)-agnostic manner. Accordingly, no distinction is made between vigilance of online communication and content relating to, for example, the personal or work domains. To extend this notion, this study proposes that, much like individuals cognitively separate life domains offline (Edwards & Rothbard, 2000), some degree of domain separation occurs in the organisation and perception of their online spheres. For example, on a basic level, it is possible for working individuals to distinguish between online communication and content that relate to their work, on one hand, and their personal interests or hobbies on the other. Based on this distinction, this study proposes *domain-specific online vigilance* as a sub-category of general online vigilance and defines it as thinking frequently and intensively about online communication or content relating to a particular life domain or role and constantly monitoring and reacting to such communication or content.

Domain-specific online vigilance provides a novel conceptual tool to explicate the role of online media in boundary blurring. Specifically, it directs attention to the degree of congruence between the user's present role and their attentional orientation towards online media. For example, when an individual is working, an attentional orientation towards work-related online communication implies, on a basic level, alignment between their role and the domain of their online vigilance. However, vigilance of online communication or content which concerns the individual's personal domain would be incongruent with their role as worker and, as such, blur the boundaries between these roles. Such boundary blurring is referred to as cross-domain online vigilance and it is defined as a constant cognitive orientation towards monitoring of and responding to online media cues that are qualitatively unrelated to the individual's offline role at a given point in time. A wide range of everyday instances of boundary blurring fit this definition – for example, a parent checking their work e-mail while spending time with their children; an office worker monitoring their personal social media during work activities or a student monitoring their instant messages while studying.

Because cross-domain online vigilance involves incongruence between present goals or tasks and attentional orientation, it implies constant attentional shifts to resolve this role conflict. These shifts may involve multitasking with media when individuals monitor or react to online cues and/or mind-wandering when individuals ruminate about their online spheres. In either case, the resulting distraction from offline tasks or goals is likely to harm performance. Le Roux et al. (2021) have shown, for example, that general online vigilance is negatively associated with academic performance ( $r = -0.17$ ) among university students.

### Cross-domain online vigilance, boundary preferences and stress

The relationship between online vigilance and well-being has, so far, received limited research attention. Johannes et al. (2018), based on a cross-sectional survey of university students, observed a negative relationship between online vigilance and mindfulness that, in turn, positively predicted affective well-being. Additionally, they observed a positive relationship between online vigilance and mind-wandering, which was a negative predictor of affective well-being. The authors conclude that, while their study shows partial support for the relationship between online vigilance and well-being, the mediating role of mindfulness is a key factor. In a more recent study, drawing on experience sampling data, Johannes et al. (2020) find small to negligible situational relations between the three dimensions of online vigilance and affective well-being. Furthermore, their findings suggest that salience along with the valence of thoughts about mediated communication predicts well-being – 'the more positively participants thought about mediated interactions in the past half an hour, the better they felt in the current moment' (Johannes et al., 2020, p. 16). Taken together, these

findings suggest that general online vigilance can, under specific circumstances, impact affective well-being outcomes, but that effect sizes would be small.

The present study extends insight into the potential role of online vigilance in well-being by investigating the association between cross-domain online vigilance and perceived stress among working individuals with a specific focus on their management of the boundary between work and personal roles. Early studies on the blurring of this boundary generally focused on work and home as the two primary domains of adult life, with home typically framed as a domain in which the individual takes on a family-oriented role (Eby et al., 2005; Wilson & Baumann, 2015). Consequently, other non-work interests, important non-family relationships and participation in non-work activities (e.g. volunteering, studies, sporting, social clubs, etc.) were mostly ignored (Eby et al., 2005; Fisher, 2001; Wilson & Baumann, 2015). For the purposes of this study, the authors adopt a broader view of the personal domain, inclusive of all non-work roles, including family and/or home roles.

While the personal domain has historically been defined narrowly, the work domain has been defined more broadly to include a wide range of roles (e.g. employer, entrepreneur, consultant, etc.) (Eby et al., 2005). To demarcate the present study, the authors focus on work roles that meet two general criteria. Firstly, the study only considers fulltime work conducted for remuneration, and, secondly, it focuses on knowledge workers specifically. Considering the lack of a precise or widely accepted definition of knowledge work (Newell et al., 2009), the study defines it broadly as work that is information-centric and involves extensive use of computer-based information technologies. Two primary motivations underlie this demarcation. Firstly, the study proposes that knowledge workers' constant involvement with digital technologies facilitates behavioural patterns characterised by frequent engagement with online media (across different domains) and, consequently, establishes environmental conditions that may encourage the development of online vigilance. Secondly, as argued by Dabbish et al. (2011), task-switching and interruptions characterise modern knowledge work, establishing fragmented work patterns as the norm. This is perhaps best exemplified in the trend towards adopting agile work practices characterised by spontaneous planning and work design (Junker et al., 2022). Knowledge workers, accordingly, are likely to face challenges when they try to impose strict boundaries between different work domains, or between work and nonwork domains.

Cross-domain online vigilance potentially plays a significant role in the development of stress among knowledge workers. Under the broad banner of *techmstress* – 'a modern disease caused by one's inability to cope or deal with ICTs in a healthy manner' (Ayyagari et al., 2011, p. 2) – a growing body of research has considered the negative implications of information or communication overload (Ragu-Nathan et al., 2008; Reinecke et al., 2017) and *telepressure* – 'the combination

of a strong urge to be responsive to people at work through message-based ICTs with a preoccupation with quick response times' (Barber & Jenkins, 2014, p. 172) – for stress-levels among workers. Across studies in this domain, findings suggest that online media, in various ways, constantly demand attention from users independent of their ongoing offline activities. Rather than the user actively 'initiating an interaction with a passive device, the devices themselves have begun actively delivering content and demanding users' attention' (Fitz et al., 2019, p. 85). Users, when they fail to manipulate their devices or environments to avoid these demands, experience continuous interruptions and attentional conflicts. Ultimately, these conflicts produce, what Lutz et al. (2020) term, setting-inconsistent pressure to be available. This form of pressure hinders employees' ability to achieve a state of balance and is therefore seen as a potential stressor. Importantly, given the ongoing cognitive processing of online communication associated with online vigilance, conflicts may occur even in the absence of interactions with devices. Freytag et al. (2021), accordingly, argue that:

[W]hen people permanently dedicate a considerable part of their cognitive resources to online communication going on in the back of their mind, they no longer have sufficient cognitive resources to deal with situational demands and, thus, feel stressed more quickly. (p. 25)

This study proposes, in accordance with this premise, that cross-domain online vigilance, between the work and personal domains, will be positively related with perceived stress among knowledge workers.

**H1:** work-related online vigilance when not working relates positively to perceived stress.

**H2:** personal-related online vigilance when working relates positively to perceived stress.

In addition to these hypotheses, the study proposes that an individual's boundary management preferences will moderate the extent to which they experience cross-domain online vigilance as stressful. Specifically, the study argues that those with a preference for domain segmentation would experience cross-domain online vigilance as more stressful than those who prefer to integrate domains. This is based on the premise that domain integrators are likely to utilise online media to achieve integration and, as such, orienting their attention towards their online domains would represent an intentional strategy (Derks et al., 2015; Kreiner, 2006; Kreiner et al., 2009). Segmentors, however, may experience online media as an obstruction or hindrance to their efforts to demarcate life domains and be present and mindful in their offline roles. In such cases, as argued by Lutz et al. (2020), the pressure of cross-domain availability demands disrupts the individual's sense of balance and triggers feelings of distress.

**H3:** work-to-personal segmentation preference moderates the relationship between work-related online vigilance when not working and perceived stress in such a way that the relationship between work-related online vigilance when not working and perceived stress is stronger when work-to-personal segmentation preference is high.

**H4:** personal-to-work segmentation preference moderates the relationship between personal-related online vigilance when working and perceived stress in such a way that the relationship between personal-related online vigilance when working and perceived stress is stronger when personal-to-work segmentation preference is high.

## Methodology

To test these hypotheses, the study conducted a cross-sectional survey among a sample of knowledge workers. Prior to data collection, noting Dienlin et al. (2021), the hypotheses and methods were registered via the Open Science Framework (OSF, <https://osf.io/c68gw?viewonly=38d2ea5e35->). All materials, data and analysis code needed to reproduce the analyses are also available via the OSF (<https://osf.io/nf6eh/?viewonly=5c74315fc2fb4d8a8fc d727d333a94d2>).

## Participants and procedure

Given the nature of the subject under investigation, the study targeted, as the population of interest, adult knowledge workers who had been employed on a full-time basis within the 3 years prior to data collection.

To determine the minimum required sample size, a power analysis was conducted using G\*Power (Faul et al., 2007). Because of the novelty of online vigilance as a construct, and the absence of prior studies investigating associations with boundary related conflict, noting Noordzij et al. (2010)'s recommendations, this study estimated an expected effect size from analyses of average effect sizes in the research domain. SRMR Rains et al. (2018), in a meta-review of meta-analyses in Communication research, found that the median effect size across 60 years of research is  $r = 0.18$ . Adopting conventional benchmarks, effects are therefore typically small to moderate in this domain. Consequently, this study aimed to be able to detect small to moderate effects ( $f^2 = 0.06$ ) in a multiple linear regression analysis with six predictors (work-related online vigilance in personal domains, personal-related online vigilance when working, work-to-personal segmentation preferences, personal-to-work segmentation preferences and the two interaction terms between segmentation preferences and cross-domain online vigilance), a conventional alpha level of 0.05 and statistical power of 0.80.

The power analysis indicated that a minimum sample of 234 participants was required. Given the possibility of incomplete responses, the uncertainty around the expected effect size and the possibility that the effect may be smaller than the estimate, the study aimed to collect as large a sample as time and resources permitted (Lakens, 2022) and specified a 5-week data collection period.

Following approval by the relevant ethics review board (REC-2020-19081), the survey was distributed via the

professional networking platform LinkedIn. At the time when the survey was shared (April 2021), many countries were under various forms of lockdown because of the COVID-19 pandemic. As such, most knowledge workers had either recently or were currently working from home and remotely communicating with their colleagues. The survey was distributed from the first author's account which, at the time, had over 670 network connections. The survey was kept open for a predetermined period of 5 weeks. At the beginning of each week, a new post was shared to promote the survey. Additionally, participation was incentivised through a lucky draw for six online shopping vouchers of R500.00 (approximately \$30.00).

The survey was accessed 580 times. After removing incomplete responses ( $n = 265$ ) and one respondent who did not provide informed consent, the initial sample included  $n = 315$  respondents. In-line with the pre-registration, to support the validity of the data, responses with implausible completion speeds were removed. Following Leiner (2019)'s recommendations for web-based surveys, it was initially planned to exclude responses five standard deviations above or below the mean. However, because of the right-skewed nature of survey response times, instead of using the standard deviation to determine a reasonable cut-off for implausible completion speed, a lower bound was set. The fastest 2% of responses were excluded ( $n = 7$ ). No evidence of straightlining was apparent. To align the sample with the target population, the authors examined responses to three items: job titles, history of full-time employment and the number of remote hours per week. This resulted in the exclusion of a further eight responses and a final sample size of  $n = 299$ , which would allow to reliably detect effects as small as  $f^2 = 0.047$  (equivalent to  $R^2 = 0.04$ ).

Respondents in the final sample were aged between 22 and 68 years old ( $M = 35.9$ , standard deviation [SD] = 8.84), with 41% classifying themselves as female and 59% as male. In terms of location, 259 (87%) of the respondents were based in South Africa at the time of survey completion, followed by residents from European countries with 23 respondents (7.7%) and 11 responses from other African countries (3.7%). For work arrangements, 129 respondents (over 40%) reported working remotely for more than 40 h per week, and a further 78 (26%) reported working remotely between 30 and 40 h per week. Taken together, those who reported working from home for more than 20 h per week accounted for nearly 80% of the sample. Over half of the survey respondents (54%) were classified as Senior in terms of job level. The sample included a wide group of professions and industries, but the bulk of the respondents were employed in IT, Engineering or Professional Services (further information on job titles is available via the supplementary materials on the OSF).

## Measures

A complete version of the survey, as originally implemented on the university's Checkbox account, is available via the OSF. At the outset of the survey, basic demographic data were

elicited, including year of birth, gender, job title/role, industry, seniority (e.g. junior, intermediate, senior, etc.), country of residence, employment status ('Have you been employed on a full-time basis in the last three years?') and the number of hours that the respondent works remotely in a typical week.

To measure cross-domain online vigilance, this study adapted the original online vigilance instrument proposed by Reinecke et al. (2018) to form two distinct measures – one for *work-related online vigilance in the personal domain* (W-OV-P) and the other for *personal-related online vigilance in the work domain* (P-OV-W). In each case, all 12 items were adapted to specify the relevant domains. For example, where the original item asked the respondent to indicate if their thoughts drifted to online content, the adapted item for W-OV-P asked if their thoughts drifted to work-related online content while they are not working and for P-OV-W it asked if their thoughts drifted to personal online content while working. In accordance with the original instrument, a Likert-scale ranging from 1 ('Does not apply at all') to 5 ('Fully applies') was used. The full sets of items are available on the OSF (<https://osf.io/nf6eh/?viewonly=5c74315fc2fb4d8a8fcd727d333a94d2>). To form an overall scale for online vigilance the responses for each dimension were averaged, with higher scores indicating more online vigilance of the respective domains.

For W-OV-P, all three sub-scales showed high internal consistency (salience  $\alpha = 0.90$ ,  $\omega = 0.90$ ; reactivity  $\alpha = 0.92$ ,  $\omega = 0.93$  and monitoring  $\alpha = 0.93$ ,  $\omega = 0.93$ ). This was also the case for P-OV-W (salience  $\alpha = 0.91$ ,  $\omega = 0.91$ ; reactivity  $\alpha = 0.90$ ,  $\omega = 0.91$  and monitoring  $\alpha = 0.87$ ,  $\omega = 0.87$ ). Cronbach's  $\alpha$  for the full 12 items in each scale was also acceptable (W-OV-P  $\alpha = 0.94$ ,  $\omega = 0.94$ ; P-OV-W  $\alpha = 0.93$ ,  $\omega = 0.93$ ). Given the novelty of the online vigilance construct and scale in general, as well as the modifications to the scale, to assess the factor structure of the two scales, a confirmatory factor analysis was conducted with the maximum likelihood method. As with the original scale (Reinecke et al., 2018), this study computed two separate second-order models with the three sub-dimensions modelled as separate latent variables loading on a second-order latent factor for P-OV-W and W-OV-P, respectively. Acknowledging Hu and Bentler (1999), model fit for both P-OV-W ( $\chi^2(51) = 210$ ,  $p < 0.001$ , Comparative Fit Index (CFI) = 0.939, Standardized Root Mean Square Residual (SRMR) = 0.04, Root Mean Square Error of Approximation (RMSEA) = 0.10, 90% confidence interval [CI] [0.09, 0.12]) and W-OV-P ( $\chi^2(51) = 255$ ,  $p < 0.001$ , CFI = 0.94, SRMR = 0.04, RMSEA = 0.12, 90% CI [0.10, 0.13]) was generally acceptable.

To measure segmentation preference, this study adapted the scale proposed by Kreiner (2006). In accordance with earlier studies (e.g. Leduc et al., 2016; Olson-Buchanan & Boswell, 2006; Park & Jex, 2011), the authors accepted the premise that a directional preference would influence boundary management strategies. As Olson-Buchanan and Boswell (2006) postulate, the strength of the boundary preference has been shown to differ depending on the direction of the

separation, for example, to keep work out of the personal domain or vice versa. Consequently, two four-item scales were used to measure, firstly, work-to-personal segmentation (e.g. 'I prefer to keep work life away from personal time') and, secondly, personal-to-work segmentation (e.g. 'I prefer to keep personal life away from work time'). A Likert-scale containing seven options ranging from 'Strongly disagree' (1) to 'Strongly agree' (7) was used for all items. Cronbach's  $\alpha$  was calculated from the completed survey data to determine the internal consistency of the scale. For both the work-to-personal ( $\alpha = 0.92$ ) and personal-to-work ( $\alpha = 0.81$ ) segmentation preferences, the scale's internal consistency was acceptable. For these scales, items were averaged, with higher scores indicating stronger segmentation preferences.

To measure general perceived stress, the study adopted the widely used Perceived Stress Scale (PSS) developed by Cohen et al. (1983). The original 14-item scale was shortened to 10 items by Cohen and Williamson (1988), the latter that was used in the present study. Respondents are asked to indicate the degree to which their experience of life was deemed 'generally stressful' in the past month using a 5-point Likert scale ranging from 'never' (0) to 'very often' (4). Scores on all positively stated items (items 4, 5, 7, 8) were reversed. The scale, which was produced by aggregating the item responses, showed acceptable internal consistency ( $\alpha = 0.85$ ). Higher scores indicate a higher level of perceived stress.

## Data analysis plan

For all statistical tests, the study used the conventional threshold for statistical significance ( $\alpha = 0.05$ ). Hypotheses H1 and H2 were tested with a multiple regression model predicting perceived stress. Subsequently, to test H3 and H4, a hierarchical multiple regression procedure was used. The first regression step corresponded to the models computed to assess H1 and H2. The second step involved adding segmentation preferences as additional predictors. The third step then involved adding the interaction between work-related online vigilance when not working and segmentation preferences and the interaction between personal-related online vigilance when working and segmentation preferences. In accordance with the pre-registration, statistically significant interaction terms would be taken as support for H3 and H4 and, in this event, further probing with a simple slopes analysis was planned. All variables were standardised prior to inclusion in the regression models.

## Ethical considerations

Ethical clearance to conduct this study was obtained from the Stellenbosch University Social, Behavioural and Education Research Ethics Committee (No. REC-2020-19081).

## Results

Table 1 provides descriptive statistics for the main study variables across the full sample. Given the non-normality of the data, for t-tests involving the two new online

vigilance scales, the study computed p-values based on bootstrap Welch t-tests with 5000 bootstrapped samples. Similarly, for correlations, robust correlation coefficients were computed using the percentage bend correlation approach and, to produce robust Analysis of Variance's (ANOVAs), the heteroscedastic one-way ANOVA for trimmed means procedure was used. The data indicate that participants report experiencing more work-related online vigilance in their personal domains than they do personal-related online vigilance in their work domains ( $t(584.55) = 9.45, p < 0.001, d = 0.69$ ). This is despite indicating stronger preferences for the segmentation of the personal domain to avoid spill-over of work-related matters compared to the preference to avoid personal matters while working ( $t(590.33) = 5.90, p < 0.001, d = 0.48$ ).

The mean value for the Perceived Stress Scale was 2.11. Freytag et al. (2021), in their study of 1024 German internet users that utilise the same scale, report a higher mean ( $M = 2.47$ ). Additionally, the variance in the present study's sample is substantially lower ( $SD = 0.24$  as opposed to  $SD = 0.82$ ). These comparisons suggest that the sample, for a wide range of possible reasons, displayed a high degree of homogeneity in terms of perceived stress that may obfuscate the hypothesised relationships.

**TABLE 1:** Descriptive statistics for key study variables.

| Variable                                   | Mean | Standard deviation |
|--|------|--------------------|
| Work-to-Personal Online Vigilance (W-OV-P) | 2.94 | 0.96               |
| W-OV-P Salience                            | 3.08 | 1.02               |
| W-OV-P Reactibility                        | 3.24 | 1.15               |
| W-OV-P Monitoring                          | 2.50 | 1.14               |
| Personal-to-Work Online Vigilance (P-OV-W) | 2.32 | 0.84               |
| P-OV-W Salience                            | 2.34 | 0.97               |
| P-OV-W Reactibility                        | 2.65 | 1.08               |
| P-OV-W Monitoring                          | 1.96 | 0.85               |
| Work-to-Personal Segmentation              | 5.71 | 1.25               |
| Personal-to-Work Segmentation              | 5.14 | 1.14               |
| Perceived Stress                           | 2.11 | 0.24               |

Figure 1 illustrates the distribution for the sub-scales of the two measures of cross-domain online vigilance. In all three instances, the mean scores were higher for work-related online vigilance experienced in the personal domain (see Table 1). To determine how these variables differed by demographic characteristics, the authors considered each in relation to age, gender, hours working remotely and seniority at work. Table 2 provides descriptive statistics for the main study variables by these categories. Statistical comparisons for each of these variables are available in the online supplementary analyses.

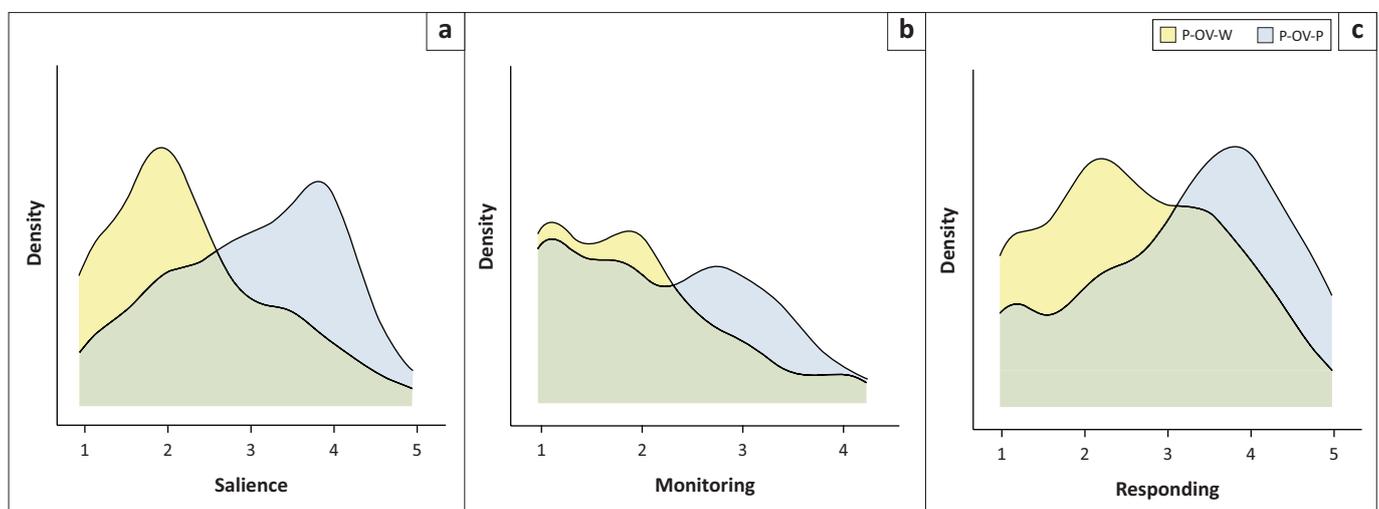
Table 3 presents the zero-order bi-variate correlations between the key study variables, including the sub-scales for the two cross-domain online vigilance variables (salience, monitoring and reactibility). As expected, these sub-scales display strong positive correlations with the overall scales in both cases (all  $r > 0.84$ ). The very small correlation between W-OV-P and P-OV-W ( $r = 0.12, p < 0.05$ ) provides additional support for the notion that, while related, these two forms of online vigilance represent distinct (though not opposite) constructs.

Personal online vigilance while working is negatively correlated with personal-to-work segmentation preference ( $r = -0.16, p < 0.01$ ), suggesting that these preferences may play a small role in countering online vigilance. The same pattern is observable in the case of work-related online vigilance while not working, which is negatively correlated with work-to-personal segmentation preference ( $r = -0.28, p < 0.001$ ).

The only variable that correlated significantly with perceived stress is the salience sub-scale of personal online vigilance while working ( $r = 0.12, p < 0.05$ ), suggesting that such salience is marginally associated with higher perceived stress.

### Pre-planned confirmatory analyses

To test the four hypotheses, a hierarchical, multiple regression consisting of three steps was conducted. In the



W-OV-P, work-related online vigilance in the personal domain; P-OV-W, personal-related online vigilance in the work domain.

**FIGURE 1:** Distributions of salience (a), monitoring (b) and responding (c) for P-OV-W and W-OV-P.

first step, the two cross-domain online vigilance variables were added as predictors of the dependent variable, perceived stress. As shown in Table 4, neither P-OV-W nor W-OV-P were statistically significant predictors of perceived stress ( $R^2 = 0.01$ ,  $F(2, 296) = 2.11$ ,  $p = 0.12$ ). Consequently, both H1 and H2 were not supported.

In the second step, personal-to-work and work-to-personal segmentation preferences were added to the list of predictor variables. In this model, personal-to-work segmentation preference was a positive predictor of stress ( $\beta = 0.14$ ,  $p = 0.03$ ), suggesting that those with a stronger preference to avoid personal matters when working experience higher levels of stress. Overall, however, the model only predicted a negligible amount of the variance

in perceived stress ( $R^2 = 0.03$ , adj.  $R^2 = 0.02$ ,  $F(4,294) = 2.57$ ,  $p = 0.04$ ).

In the final step, to test H3 and H4, the interactions between cross-domain online vigilance and boundary preferences were added as predictors to the model. This included, firstly, the interaction between work-to-personal online vigilance and work-to-personal segmentation preference, and, secondly, the interaction between personal-to-work online vigilance and personal-to-work segmentation preference. As shown in Table 4, neither of these interactions were predictors of perceived stress and their addition to the model did not improve the amount of variance in perceived stress explained by the model ( $R^2 = 0.04$ , adj.  $R^2 = 0.02$ ,  $F(6,292) = 2.05$ ,

**TABLE 2:** Descriptive statistics for key study variables by demographic factors.

| Variable            | n   | W-OV-P |      | P-OV-W |      | W-P Seg Pref |      | P-W Seg Pref |      | PSS  |      |
|---------------------|-----|--------|------|--------|------|--------------|------|--------------|------|------|------|
|                     |     | M      | SD   | M      | SD   | M            | SD   | M            | SD   | M    | SD   |
| <b>Seniority</b>    |     |        |      |        |      |              |      |              |      |      |      |
| Junior              | 44  | 2.91   | 0.98 | 2.57   | 0.81 | 6.22         | 0.98 | 5.22         | 0.88 | 2.18 | 0.25 |
| Intermediate        | 93  | 2.97   | 0.93 | 2.44   | 0.82 | 5.68         | 1.22 | 5.14         | 1.11 | 2.10 | 0.25 |
| Senior              | 162 | 2.93   | 0.98 | 2.18   | 0.83 | 5.60         | 1.31 | 5.11         | 1.22 | 2.09 | 0.23 |
| <b>Gender</b>       |     |        |      |        |      |              |      |              |      |      |      |
| Male                | 177 | 2.94   | 0.95 | 2.30   | 0.82 | 5.60         | 1.30 | 5.16         | 1.16 | 2.10 | 0.23 |
| Female              | 122 | 2.95   | 0.99 | 2.34   | 0.86 | 5.88         | 1.17 | 5.11         | 1.10 | 2.12 | 0.25 |
| <b>Remote hours</b> |     |        |      |        |      |              |      |              |      |      |      |
| 0–10 h              | 35  | 2.60   | 1.07 | 2.22   | 0.87 | 6.14         | 0.89 | 5.29         | 0.84 | 2.18 | 0.20 |
| 10–20 h             | 29  | 2.98   | 1.03 | 2.40   | 0.87 | 4.92         | 1.64 | 4.89         | 1.15 | 2.10 | 0.26 |
| 20–30 h             | 28  | 2.88   | 1.02 | 2.14   | 0.85 | 5.69         | 1.30 | 5.36         | 1.00 | 2.18 | 0.28 |
| 30–40 h             | 78  | 2.86   | 0.97 | 2.50   | 0.84 | 5.87         | 1.14 | 5.15         | 1.06 | 2.10 | 0.25 |
| 40+ h               | 129 | 3.09   | 0.89 | 2.25   | 0.81 | 5.69         | 1.23 | 5.10         | 1.27 | 2.08 | 0.23 |

SD, standard deviation; W-OV-P, work-to-personal online vigilance; P-OV-W, personal-to-work online vigilance; W-P Seg Pref, work-to-personal segmentation preference; P-W Seg Pref, personal-to-work segmentation preference; PSS, Perceived Stress Scale.

**TABLE 3:** A correlation matrix of key study variables.

| Variable               | 1       | 2       | 3       | 4     | 5        | 6        | 7        | 8        | 9       | 10   |
|------------------------|---------|---------|---------|-------|----------|----------|----------|----------|---------|------|
| 1. P-OV-W              | -       | -       | -       | -     | -        | -        | -        | -        | -       | -    |
| 2. P-OV-W Monitoring   | 0.85*** | -       | -       | -     | -        | -        | -        | -        | -       | -    |
| 3. P-OV-W Reactibility | 0.87*** | 0.6***  | -       | -     | -        | -        | -        | -        | -       | -    |
| 4. P-OV-W Salience     | 0.87*** | 0.65*** | 0.6***  | -     | -        | -        | -        | -        | -       | -    |
| 5. W-OV-P              | 0.12*   | 0.09    | 0.16**  | 0.05  | -        | -        | -        | -        | -       | -    |
| 6. W-OV-P Monitoring   | 0.06    | 0.07    | 0.06    | 0.02  | 0.88***  | -        | -        | -        | -       | -    |
| 7. W-OV-P Reactibility | 0.09    | 0.04    | 0.16**  | 0.01  | 0.88***  | 0.66***  | -        | -        | -       | -    |
| 8. W-OV-P Salience     | 0.18**  | 0.13*   | 0.21*** | 0.11  | 0.85***  | 0.62***  | 0.64***  | -        | -       | -    |
| 9. P-W Seg Pref        | -0.16** | -0.2*** | -0.13*  | -0.09 | 0.09     | 0.07     | 0.09     | 0.07     | -       | -    |
| 10. W-P Seg Pref       | 0.06    | 0.02    | 0.02    | 0.11  | -0.28*** | -0.26*** | -0.21*** | -0.26*** | 0.32*** | -    |
| 11. Perceived Stress   | 0.06    | 0.01    | 0.03    | 0.12* | 0.11     | 0.07     | 0.10     | 0.11     | 0.14    | 0.04 |

W-OV-P, work-to-personal online vigilance; P-OV-W, personal-to-work online vigilance; WP Seg Pref, work-to-personal segmentation preference; P-W Seg Pref, personal-to-work segmentation preference.

\*\*\*,  $p < 0.001$ , \*\*,  $p < 0.01$ , \*,  $p < 0.05$ .

**TABLE 4:** Results of the hierarchical regression procedures used to test the hypotheses.

| Variable             | Model 1 |       |      |      | Model 2 |      |       |      | Model 3 |      |       |      |
|----------------------|---------|-------|------|------|---------|------|-------|------|---------|------|-------|------|
|                      | $\beta$ | SE    | t    | p    | $\beta$ | SE   | t     | p    | $\beta$ | SE   | t     | p    |
| P-OV-W               | 0.05    | 0.060 | 0.86 | 0.39 | 0.07    | 0.06 | 1.20  | 0.23 | 0.07    | 0.06 | 1.24  | 0.22 |
| W-OV-P               | 0.10    | 0.06  | 1.5  | 0.08 | 0.09    | 0.06 | 1.49  | 0.14 | 0.11    | 0.06 | 1.67  | 0.10 |
| PW Seg Pref          | -       | -     | -    | -    | 0.14    | 0.06 | 2.15* | 0.03 | 0.12    | 0.07 | 1.75  | 0.08 |
| WP Seg Pref          | -       | -     | -    | -    | 0.02    | 0.07 | 0.28  | 0.78 | 0.05    | 0.07 | 0.67  | 0.50 |
| P-OV-W * PW Seg Pref | -       | -     | -    | -    | -       | -    | -     | -    | 0.07    | 0.06 | 1.26  | 0.21 |
| W-OV-P * WP Seg Pref | -       | -     | -    | -    | -       | -    | -     | -    | -0.05   | 0.06 | -0.88 | 0.38 |

W-OV-P, work-to-personal online vigilance; P-OV-W, personal-to-work online vigilance; WP Seg Pref, work-to-personal segmentation preference; P-W Seg Pref, personal-to-work segmentation preference;  $\beta$ , standardised regression coefficients; SE, standard error of  $\beta$ .

\*\*\*,  $p < 0.001$ , \*\*,  $p < 0.01$ , \*,  $p < 0.05$ .

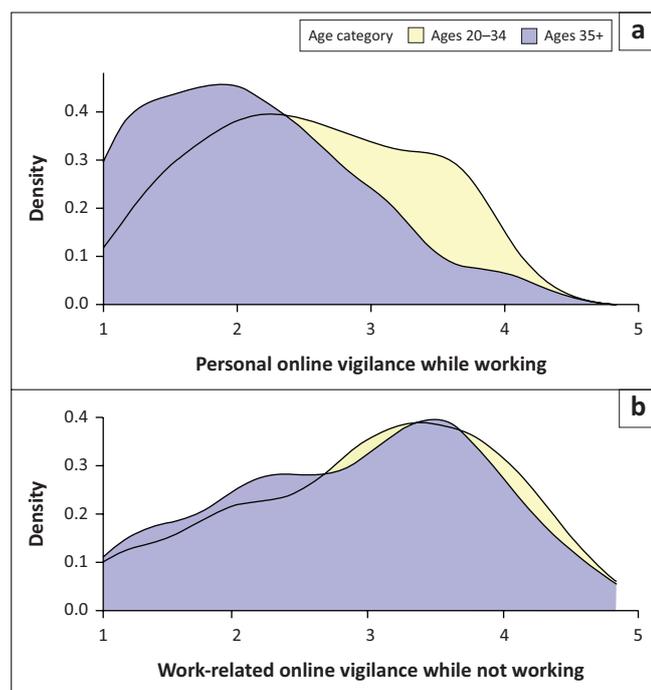
$p = 0.06$ ). Consequently, both H3 and H4 were not supported.

### The role of age in cross-domain online vigilance

Considering the negative correlation observed between age and personal online vigilance while working, an exploratory analysis was conducted to further investigate this effect. The authors created two sub-samples for respondents older and younger than 35 (the median age for the sample). Figure 2 illustrates the distribution of the two cross-domain online vigilance variables for the two age categories. While the distributions are similar for work-related online vigilance, workers between the ages of 20 and 34, as suggested by the negative correlation, experience higher personal online vigilance while working. This suggests that younger workers ( $M = 2.54$ ,  $SD = 0.82$ ), more than their older colleagues ( $M = 2.11$ ,  $SD = 0.80$ ), experience greater difficulty in psychologically disconnecting from their personal online spheres while they are performing work-related tasks ( $t(295.21) = 4.59$ ,  $p < 0.001$ ,  $d = 0.53$ ). The finding that this age-related difference is not mirrored in the case of work-related online vigilance when not working ( $t(296.28) = 0.81$ ,  $p = 0.42$ ,  $d = 0.09$ ) supports the idea of distinction between different forms or types of online vigilance based on the target content/domain.

### Conclusion

This study adopted a survey-based methodology to conduct a cross-sectional investigation of the role of cross-domain online vigilance and work-personal boundary segmentation preferences in stress among a sample of knowledge workers.



P-OV-W, personal-to-work online vigilance; W-OV-P, work-to-personal online vigilance.

**FIGURE 2:** Distributions of P-OV-W (a) and W-OV-P (b) for younger and older workers.

Despite previous research showing negative associations between general online vigilance and perceived stress (Freytag et al., 2021), the findings of this study did not support the hypotheses that cross-domain online vigilance, in either the work-to-personal or personal-to-work directions, predicts levels of perceived stress. The authors consider three potential interpretations of this finding. Firstly, it may suggest that contrary to the interpretations of earlier findings (e.g. Barber & Jenkins, 2014; Fitz et al., 2019), cross-domain online vigilance is not an important factor in perceived stress. While acknowledging that such vigilance, at high levels, likely implies a degree of communication or information overload, such overload may not be experienced as particularly stressful by most knowledge workers. This may suggest that knowledge workers have, over time, developed a variety of skills and/or techniques that enable them to cope effectively with the demands of permanent online availability across multiple life domains. Secondly, the sample size may have been too small to enable observation of small effect sizes. However, considering the negligible amount of variance in perceived stress accounted for by the model, the authors remain doubtful that cross-domain online vigilance plays an important role in stress. Moreover, if smaller effects were observed, their practical significance is questionable. Thirdly, it is important to note the narrow distribution of perceived stress scores in the data set. While the scale theoretically ranges from 1 to 5, the scores ranged from 1.4 to 2.8 with very low deviation ( $M = 2.11$ ,  $SD = 0.24$ ). This lack of variance in the dependent variable may explain the lack of support for H1 and H2. The authors recommend that future studies employ multiple measures that describe individual's experiences of stress.

Additionally, the study's findings did not support H3 and H4, suggesting that individuals' preferences for domain segmentation, when considered together with cross-domain online vigilance, do not play an important role in perceived stress. The negative associations between boundary segmentation preferences and levels of online vigilance (in both directions) suggest that individuals who prefer to avoid the blurring of their personal-work boundaries are partly successful in their boundary management efforts. However, the results of the regression model suggest that, even for those who prefer to segment life domains, the experience of cross-domain online vigilance is not an important stress factor. This finding, again, seems to contradict the notion that those who prefer to segment their life domains may experience constant psychological connectedness and the demands of permanent online availability as stressful (Barber & Santuzzi, 2015). The same caveats (small sample size and lack of variance in the data) are applicable here and the authors propose, as a result, that the findings be interpreted with care. Additionally, the study proposes that future research investigate these associations further to verify the results.

Despite the lack of support for the hypotheses, the authors believe that the notion of cross-domain online vigilance presents a novel and interesting lens for the analysis of the role online

media play in boundary blurring. Two findings, in particular, support this line of reasoning. Firstly, the small correlation between personal-to-work and work-to-personal online vigilance suggests that they do indeed represent different forms or types of online vigilance. While the measurement of general online vigilance may be appropriate in some studies, the authors propose that researchers also consider this construct in a domain-specific manner with recognition of the congruence between present offline settings and the content of online vigilance. Secondly, the findings indicate that, while the study found no evidence that age impacts work-to-personal online vigilance, younger workers (ages below 35) report experiencing a higher level of personal-to-work online vigilance. This may suggest that workers who grew up in an era during which one's presence on and involvement with social media emerged as a key aspect of one's social identity may find it more difficult to psychologically disconnect from their personal online domains. Their older colleagues, by contrast, may identify less strongly with their online persona and, consequently, be less attentive to cues in their personal online spheres. Future research is needed to further probe these differences. Specifically, a larger sample size is required to power tests aimed at assessing subgroup differences. Furthermore, if sufficiently powered, studies could consider conducting a bifactor Confirmatory Factor Analysis (CFA) to explore whether the grouping factor (i.e. the age groups) explains any variance in the scale items beyond the general factor.

These findings may have important implications for organisational management. In line with extant evidence of the prevalence of behaviours like cyberslacking in the workplace (e.g. Lim & Chen, 2012), personal online vigilance may impact younger workers' ability to stay on-task and be productive during work hours. Importantly, unlike cyberslacking, which involves active media engagement, the salience component of personal online vigilance reflects the individual's attentional orientation rather than their behaviour. The effects of this type of psychological connectedness to the online sphere on work performance may be particularly difficult to measure.

In addition to the relatively small sample size and the lack of variance in perceived stress in the sample, three further limitations are worth noting. Firstly, the study utilised a convenience sample for data collection which is not demographically representative of the knowledge workers in South Africa and elsewhere, limiting the generalisability of the findings. Secondly, uncertainty remains over the adaptation of the online vigilance instrument. While the confirmatory factor analyses indicated general acceptability of cross-domain online vigilance, the findings should be interpreted with caution and further testing of the instruments should be conducted. Specifically, while the study followed the same procedure as Reinecke et al. (2018) to assess the higher-order factor structure for the construct, further factorial tests are required to confirm the hierarchical structure. Future adopters of the scale should assess this structure using, for instance, the sequence of tests proposed by Credé and Harms (2015). Thirdly, the authors limited the study to only consider work that is information-centric and

computer-based. This implies that the findings may not extend to workers in other types of roles. Finally, despite controlling for some alternative variables, the cross-sectional design of the study does not permit to draw any conclusions of a causal nature. Even if the authors did find support for the hypotheses, it would remain unclear whether cross-domain online vigilance is causative of stress.

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### Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

### Authors' contributions

L.C. conceptualised the study, conducted a literature review, designed and executed the empirical work and reported the findings. D.B.I.R. and D.A.P. supervised the project, guided key decisions in the conceptualisation and design of the empirical work and reviewed and edited the text.

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### Data availability

The data that support the findings of this study are available from the corresponding author, D.B.I.R., upon reasonable request.

All materials, data and analysis code needed to reproduce the analyses are also available via the Open Science Framework (OSF) (<https://osf.io/nf6eh/?viewonly=5c74315fc2fb4d8a8fcd727d333a94d2>).

### Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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