Does Working-From-Home Work? A Multidimensional Investigation of the Effect of Workspace Environment on Self-Control

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Abstract

This research report aimed to investigate whether workspace environment, specifically working-from-home versus working at a company-owned premises, affects the self-control of employees. Firstly, self-control has been measured in many ways in past research. However, by examining the literature it was discovered that utilising both state and actual measures of self-control would provide a comprehensive measurement of self-controlled behaviour in employees. Previous research has indicated contrasting evidence to the affect workspace environment may have on self-control. Some research states that increased privacy and control in a WFH environment may increase self-control. Other research, such as the process and ego-depletion models of self-control, provide evidence which indicates that increased visual distractions in a WFH environment will decrease self-control in employees. The present study used response inhibition, behavioural and trait measurements of self-control in a sample of employees who worked in different spaces. Analysis did not find a difference in self-control on any measure between different workspaces. This finding may be due to mediating factors, such as privacy, control and perceived isolation which were not controlled for in the present study. However, some interesting correlational findings exist. Correlations existed between response inhibition and behavioural measures of self-control; however, the trait measure did not correlate and provided a low reliability score. This may indicate that this measure should be modified in future uses. Correlations were also discovered for self-control measures and sleep, age and motivation. This adds evidence to past research which indicates these factors influence performance on self-control tasks. Overall, more research is needed to determine the effect of workspace environment on employee's self-control.

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Behaviour is always directed towards a goal (Mousavi et al., 2024). These goals may be short-term and simple (e.g. buying a coffee), or long-term and complex (e.g. saving for a house). The duration and complexity of these goals vary across a continuum. However, at any one point in time, a person will hold many goals, all differing across this continuum. This can lead to self-control dilemmas, where an individual must choose between exhibiting behaviour that may allow for progress towards one goal but be counterproductive for another. Self-control refers to when an individual chooses to exhibit behaviour in line with longer term goals with larger rewards, forgoing smaller, shorter-term goals (De Ridder et al., 2018; Mousavi et al., 2024).

Measurement of Self-Control

Clearly defining self-control involves understanding how self-control is measured. The recent increase in self-control research has resulted in a wide range of strategies to measure the construct. De Ridder et al. (2018) completed a meta-analysis on the effect of self-control on a range of life domains. They note that in previous research self-control has been measured in two forms: state and trait.

State measures of self-control define a more transient ability where self-control is measured at a specific moment, during a specific task. These measures emphasise that self-control relies on a process of response inhibition where participants are presented with conflicting goals and distracting stimuli and must respond to the goal, while ignoring the distraction. A commonly used example of measuring state self-control behaviour is to use a response inhibition task. This is considered a measure of the actual cognitive ability of state self-control (Nigg, 2016). An example is the Stroop Colour-Word Test (SCWT), where

participants are asked to indicate what colour a word spells (goal-oriented stimulus), while ignoring the ink colour of the written word (distracting stimulus). In congruent trials, the colour-word and ink colour match (e.g., BLUE written in blue ink). In incongruent trials, the colour-word and ink colour do not match (e.g., BLUE written in red ink). Responding in incongruent trials is more difficult as participants must utilize response inhibition, rather than relying on automatic responding (Cohen et al., 1990). Therefore, the SCWT is a measure of state self-control behaviour (Nigg, 2016).

Another way to measure state self-control is with delay-discounting tasks. Delay discounting describes the process by which the subjective value of a reward decreases as delay to receiving that reward increases (Koffarnus & Bickel, 2014). Some tasks use real or actual rewards, such as the Marshmallow Test by Mischel and Ebbesen (1970). In this experiment, researchers presented children with one marshmallow and told them that they could choose to either eat the marshmallow now or wait until the researcher returned. However, if they waited until the researcher returned, they would be given another marshmallow. Waiting was the self-controlled decision, while eating the marshmallow was the impulsive decision. In other tasks, participants are given the choice between two hypothetical rewards: a smaller reward immediately, or a larger reward at a specified later time. For example, Rachlin et al. (1991) asked college students whether they would be more likely to choose to receive a smaller amount of money now or a larger amount of money in one month. Choosing the larger amount of money delivered later is considered self-controlled while choosing the smaller amount of money delivered immediately is considered impulsive. In these tasks, the typical finding is that choice of the larger-later amount (larger amount of money or more marshmallows delivered later) decreases as the delay to its receipt increases, illustrating delay discounting.

Trait self-control is measured as the ability to act self-controlled which remains stable over a longer period. These measures seek to describe a self-control that acts more as a personality trait and has little variation over time and context (De Ridder et al., 2018). This is often completed using self-report questionnaires, for example, the Brief Self-Control Scale by Maloney et al. (2012). This questionnaire seeks to measure how self-controlled individuals judge themselves to be by responding to how well certain statements describe them.

But, to what extent do these measures describe the same construct? De Ridder et al. (2018) found a clear relationship between trait and state self-control measures. They also found that measurements of self-control and actual, observed behaviour were correlated. However, they also found that self-report trait measures had a stronger correlation with positive life outcomes, when compared to other measures. This may indicate that an individual's subjective interpretation of their self-controlled behaviour has a stronger relationship with positive life outcomes when compared with observation of an individual's behaviour in state self-control tasks. Furthermore, the relationships between trait self-control and hypothetical behaviour were stronger than actual behaviour. This indicates a possible difference between the level and effect of self-control illustrated in each type of measurement.

Overall, De Ridder et al. (2018) summarize that studies which only use self-report measures of self-control may overestimate the true effect of self-control. When state and trait measures of self-control were taken together with close temporal distance, this resulted in larger effect sizes. It was also assumed that this would indicate a more reliable measurement of actual self-control behaviour. This study indicates that in previous research there have been a variety of ways to operationalise and measure self-control. By combining measurements within the same study, it is easier to determine the effect of self-control on a specified domain.

Theories of Self-Control

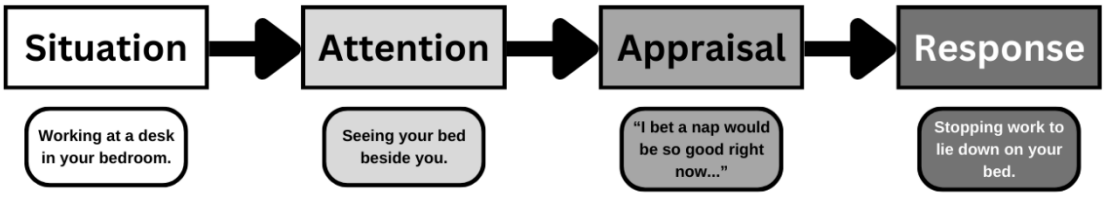
An important factor which influences whether an individual chooses to be self-controlled is the environment in which the self-control dilemma occurs. Models and strategies of self-control have provided theoretical backing to this claim. There are two main models used to understand and explain the construct of self-control and how it occurs, ego-depletion and process models of self-control. The ego depletion model suggests that self-control relies on a specific energy source which, once depleted, results in the individual being unable to exert self-controlled behaviour. The model explains that if a person exhibits self-controlled behavior now, they will have less ability to be self-controlled in the future (Inzlicht & Schmeichel, 2012). Laboratory studies have provided evidence to support this model. For example, Baumeister et al. (1998) presented undergraduates with both cookies and radishes. They discovered that students asked to eat radishes (assumed to be utilizing more self-control to eat the less-tasty option) were faster at quitting working on unsolvable puzzles than students previously asked to eat cookies. This suggested that the students who ate radishes had their self-control reserves depleted before being presented with the puzzle and, therefore had less self-control available to utilize, quitting faster than students who ate cookies.

The process model of self-control states that self-control is a four-stage process. The first stage is the objective situation. This describes the individuals' current environment and their perception of it. Within this environment, an individual's attention is directed towards a specific object which leads to a cognitive appraisal where the self-control dilemma occurs. Finally, a behaviour will occur (Duckworth et al., 2016). As the first stage of this model is an objective situation, it is fair to assume that an individual's environment is an important influence on whether a self-control dilemma will occur. This is illustrated in Figure 1 with an example of generation of a counterproductive impulse, leading to impulsive behaviour. Duckworth et al. (2016) explain that using strategies to modify the environment is key to

successfully exhibiting self-controlled behaviour. This is known as employing preventative strategies. They work off the assumption that impulsive behaviour is cued by the environment (as in the process model). If there are fewer distracting stimuli in the environment, there will be less chances for an individual to have to make the choice between impulsive and self-controlled behaviour. The ego depletion model can be used to further explain why different changes in future behaviour might occur in different environments. If an individual is constantly having to act more self-controlled, they will be less likely to be self-controlled in the future (Inzlicht & Schmeichel, 2012). Therefore, by modifying the environment, an individual can reduce the chance of having to make a self-controlled choice and reduce ego depletion. This will not only result in higher present self-control, but also allow for more self-control resources in the future. Overall, this line of reasoning suggests that an individual's environment has a strong influence on self-control, through evidence from both the ego-depletion and process models of self-control.

Figure 1

Generation of an Impulse for Counterproductive Behaviour While Working Through the Process Model of Self-Control



Impacts of Self-Control

Mental and Physical Health

Self-control has been found to correlate with many positive life outcomes. These include mental and physical health, relationship quality and even pace of biological aging.

These results have been found across longitudinal studies and while accounting for confounding variables. Moffitt et al. (2011) conducted a longitudinal study into the relationship between childhood self-control and health, finances and deviancy. They discovered that higher self-control in childhood predicted better physical health, lower rates of substance dependence, better financial positions and lower rates of criminal offending. These findings were significant, even after controlling for intelligence, social class or mistakes made in adolescence. These findings also occurred in sibling-pairs where the sibling with higher self-control in childhood had better outcomes. This illustrates that self-control is not purely dependent on genetic characteristics but is also influenced by external factors. Boals et al. (2011) investigated the effect of self-control on mental health and discovered that higher self-control predicted better mental health outcomes (e.g., lower rates of anxiety and depression). They hypothesized that this relationship existed due to differences in coping strategies utilized by people with higher versus lower self-control. They discovered that participants with lower self-control were more likely to utilize unhealthy coping strategies, such as avoidance coping. This was, in turn, responsible for poorer mental health outcomes and mediated the link between self-control and mental health.

Interpersonal Relationships

Self-control is an important factor for increased relationship quality and satisfaction. Vohs et al. (2011) completed a study on trait self-control levels in platonic, familial and romantic relationships. They used friend, sibling and married partnerships as participants in the study and collected data on the self-control level of each partner. They determined two separate scores. A sum of overall self-control in a partnership (summation) and difference between self-control levels in each partnership (difference). Although previous assumptions state that similarity in a range of traits is key to relationship success (e.g., Byrne & Nelson, 1965), this study found that a higher summation of self-control in a relationship indicated

better relationship quality, whereas difference between partners self-control did not correlate with relationship quality. This indicates that self-control is an important factor in relationship quality, however, it is interesting to note that it is not the individual levels of self-control that matter, but rather the overall summation of self-control in a relationship. It can be concluded that if an individual has higher self-control, they will enjoy more positive interpersonal outcomes by increasing the summation of self-control in their relationships. Overall, this provides evidence towards the importance of self-control in relationship quality and further illustrates why understanding the factors which may increase or decrease self-control is important.

Biological Aging

Perhaps the most intriguing link between self-control and life outcomes is the research on biological aging. Belsky et al. (2017) tracked changes in 18 biomarkers to determine biological pace of aging across 12 years in a cohort of New Zealanders. They used these biomarkers to operationalise the measurement of pace of aging by tracking the loss of integrity of bodily systems over time. They found that lower self-control levels in childhood significantly predicted accelerated biological aging during participants 20s and 30s. Richmond-Rakerd et al. (2021) completed another longitudinal study of self-control and biological aging. Their results mirrored that of Belsky et al. (2017) as adults in their study who had higher levels of self-control in childhood had slower body and organ aging and less aging signs in their brain. These results were also found to be independent of social class and intelligence. However, it was noted that the results from these two studies may be due to the effects of self-control on positive health behaviours throughout the lifespan. This indicates that self-control in childhood might encourage healthier behaviours (e.g., lower rates of harmful behaviours such as smoking or drinking), which create healthier biological functioning, influencing pace of biological aging. Thus, these findings point to the conclusion

that self-control impacts biological functioning, perhaps via its influence on health-promoting behaviours. Furthermore, Richmond-Rakerd et al.'s (2021) research extended findings by discovering that self-control levels changed across the lifespan, and that midlife adulthood self-control levels predicted better aging outcomes in the future. This was found while accounting for childhood self-control levels. Therefore, not only is childhood self-control important for biological aging, but adult levels of self-control can change over time and continue to influence aging throughout the lifespan. Thus, providing justification for investigating changes in self-control throughout adulthood.

In summary, research on the relationship between self-control and positive life outcomes has illustrated that it is important for increased quality of health, relationships and lifespan. This points to the importance of both measuring and understanding self-control throughout the lifespan and investigating the factors which influence this construct. Understanding these factors could inform policy changes and provide further information to the public about how to increase self-control. Previous research indicates that this could potentially lead to a population with better life outcomes.

Life Domains

Current research should focus on investigating the domains in which self-controlled behaviour provides the most useful outcomes. Previous literature has indicated that academic and job performance is significantly influenced by self-control and that this relationship is stronger than the relationship between self-control and success in other life domains. Tangney et al. (2004) identified that self-control should be relevant in five domains: achievement and task performance, impulse control, psychosocial adjustment, moral emotions and interpersonal functioning. Their subsequent research confirmed their hypothesis by finding significant positive relationships between self-control and each domain. De Ridder et al. (2018) extended this through a meta-analysis on self-control and a range of life domains.

They discovered that self-control is more effective at inhibiting some behaviours than others (e.g., small effect sizes were found between self-control and dieting behaviours), and that the effects of self-control differ dramatically across life domain outcomes. They investigated four life domains: school and work performance, eating and weight behaviour, interpersonal functioning, and well-being and adjustment. The largest effect sizes were found for school and work performance. This suggests that self-control is particularly important in this domain. De Ridder et al. explain that this may be due to the importance of maintaining successful routines that support effective performance over time. Furthermore, success in some life domains may have more dependence on factors unrelated to self-control. For example, maintaining a healthy weight may depend not only on self-controlled eating behaviours, but also genetic dispositions and other, uncontrollable factors. Whereas completing overtime or extra work (leading to success in the workplace) is more contingent on self-controlled behaviour, with less impact from other factors, such as genetics. These findings support the assumption that investigating self-control in the workplace is important due to its significant effect on job performance, which may supersede that of the effect of self-control on other life domains (De Ridder et al., 2018).

The Changing Nature of The Workspace

Investigating self-control in the workplace is important due to the strength of relationships between self-control and professional success. However, a variety of workspace environments exist, all with different effects on employees. Research on workspace has primarily focused on the difference between private versus open-plan offices (Khader, 2024). However, in recent years, a unique workspace has emerged as a popular new option for office workers. COVID-19 introduced lockdowns to many countries around the world, where people were kept isolated in their own homes to stop the spread of the highly contagious virus. This resulted in many companies and institutes having to adopt remote working

practices, so employees could continue to work while isolated at home. Once the lockdowns ended, employees could return to working at company-owned premises, however many companies continued allowing remote working conditions for employees. Recent reports from 2023 have found that 75% of New Zealanders work-from-home (WFH) at least once per week, and 52% wanted to WFH more frequently. Therefore, the workspace environment of many employees has changed to a WFH (or hybrid) environment, and this is only increasing in popularity (Matika, 2023).

Research on WFH has increased since the COVID-19 pandemic, in line with its continued rise in popularity. This research has mainly focused on wellness and productivity. In wellness research, WFH employees reported feeling that the WFH environment had a negative effect on their wellbeing and that they were less connected to their colleagues (McPhail et al., 2023). These findings are corroborated by studies which have demonstrated the negative effect of WFH on employee's work-life balance and an increase in the reported experience of burn out in employees (Sharma et al., 2022). However, other studies have reported contrasting effects, where employees feel more able to maintain a balance between family and work-life (Giang et al., 2023). Employee motivation has also been found to decline in WFH environments, due to increased distractibility (Aiswarya & Perwez, 2023; Khader, 2024). Despite this, the productivity of WFH employees has been reported to increase by 13% (Bloom et al., 2014). These findings illustrate that workspace environment, especially WFH, influences employee's wellness and productivity.

The Impact of Workplace Environment on Self-Control

As introduced earlier, previous research has shown that self-control is related to greater job performance. Research has also indicated that this relationship may be mediated by workspace environment, leading to the possibility of an effect of WFH on self-control. Moon et al. (2020) investigated the relationship between self-control and off-task thoughts/

behaviours in undergraduate university students and employees. They discovered that individuals with lower trait self-control had increased off-task thoughts/ behaviours, which negatively affected GPA, job performance and task completion. Self-control not only predicted distractions in the workplace, but also interruptions. Distractions are internally initiated (e.g., off-task thoughts), whereas interruptions are externally initiated (e.g., a coworker stopping by your desk for a chat). They explain that individuals with higher self-control may be able to achieve greater task performance by using willpower in the moment of a self-control dilemma in order to choose the self-controlled option (present regulation) and proactively selecting environments which have less likelihood of tempting them with a dilemma, or modifying an environment to have less temptation (preventative strategies). In this explanation of the mechanisms underlying the relationship between self-control and behaviour, it could be assumed that self-controlled employees may decide to work from home more as an effort to demonstrate preventative strategies to reduce interruptions during the workday.

Research has shown that self-control demands influence job performance in employees. Bridger and Brasher (2011) investigated both cognitive task and self-control demands in office workers. Cognitive task demands indicate the cognitive difficulty of the task's employees were required to complete. Self-control demands indicate the amount of self-control employees must exhibit. Higher self-control demands indicate more self-control dilemmas faced by employees. They discovered that both factors negatively impacted mental well-being. Therefore, the higher difficulty an employee faced, and the more self-controlled they were required to act, the lower their mental wellbeing was. The most intriguing finding from their study was that the self-control of employees who worked in open plan office spaces had a stronger influence on their mental wellbeing when compared to employees who

worked in smaller, more private office settings. The more self-controlled they had to be within the workspace, the more their mental well-being was affected.

Privacy in office work is a topic which has been prevalent in research for many years (Sundstrom, 1966) as there is a common difficulty in deciding between providing privacy to reduce distraction, facilitating the need for communication in the office and utilizing the most cost-effective office layout. Bridger and Brasher (2011) found that a lack of privacy at work, as illustrated by open plan offices, increases the mental demands of working life. This may be due to the theory that open plan offices reduce control over employees' physical and social environment, increasing self-control dilemmas. They conclude that, in employees who prefer privacy while working, open plan offices are a job stressor, reducing mental health and job performance. This theory is backed by further research in both office (e.g., Lee & Brand, 2010) and non-office (e.g., Bridger et al.'s, 2011) workplaces. These studies illustrate that workspace environment has a strong influence on job performance. They also illustrate the importance of reducing distractions and increasing employees' control over their environment to increase performance.

The modern move to a WFH workspace environment can be summarized as an extreme version of privacy in the workspace environment. Previous research on workspace privacy and control emphasise the importance of these elements in a workspace environment to increase job performance. Based on this, it could be assumed that the WFH space allows for extra control in employees' choice of workspace and increases privacy. Thereby increasing mental health, job satisfaction and performance. However, an important distinction in the effect of distraction in workplace environments should be considered. As previous research has indicated, private office spaces are often linked to higher job performance due to a reduction in distractions. Although the WFH environment may be private and provides strong control by employees of where they want to work, such environments may include

more distracting stimuli. Overall, the WFH environment may increase control and privacy, however, may also increase distractions. No previous research has investigated the relationship between WFH versus more traditional workspaces and self-control. This study aims to fill this gap.

The Current Study

The current study aimed to investigate the effect of workspace environment on self-control. With the fast-tracked move to hybrid working environments across industries, it is important to understand how different working environments affect employees' behaviour. This may allow for the creation of company/ institution policies around the use of hybrid working environments to increase employees' comfort and productivity. In line with previous findings from De Ridder et al. (2018), I measured self-control in three ways. These are termed response inhibition, state behavioural and trait self-report measures. They measured self-control by task performance, hypothetical behaviour and self-report to create a holistic view of self-control. Furthermore, the different measurements were compared to determine whether correlations exist between them. These were administered to employees who work in a range of environments to create a multidimensional study of the effect of workspace environment on self-control. Basic demographic information was collected, and several control variables measured. Previous research indicates that sleep and motivation affect self-control scores; for example, Pilcher et al. (2023) has shown that sleep deprivation has been found to lower scores in response inhibition tasks. Therefore, more hours of sleep should increase performance on the response inhibition tasks. Motivation has been found to influence overall self-control levels (Burgoyne et al., 2023), therefore, higher motivation should increase performance on self-control tasks. Thus, controlling for sleep and motivation allowed for assessment of the influence of workspace environment on self-control independent of other factors that may impact self-control.

Based on previous research, several hypotheses were formulated. The main hypothesis, Hypothesis 1, states that self-control scores should differ between workspace groups. Previous research indicates that employees who work-from-home have lower self-control scores compared to employees who work in different environments, due to increased distractibility (Inzlicht & Schmeichel, 2012). However, other research indicates contradictory assumptions, such as that of Bridger and Brasher (2011) who found that privacy and increased control in a workspace environment increases self-control. Therefore, a two-tailed hypothesis is presented, which states that there will be a difference between self-control in differing workspace environments. Hypothesis 2 has a clearer direction for how the WFH environment affects employee's self-control. It states that a private WFH environment, dedicated to office work, will have fewer distracting stimuli (decreasing self-control dilemmas), increase employee control and decrease intrusions (Inzlicht & Schmeichel, 2012; Bridger & Brasher, 2011; Duckworth et al., 2016). This will result in employees who WFH in a private environment having higher self-control scores than employees who WFH in a distracting environment (e.g., bedroom desk).

Hypothesis 3 states that scores on the three self-control measures should correlate with each other. Two scores of self-control were collected from the response inhibition task (reaction time and accuracy). Both were measured and combined for each specific trial type and overall. Overall accuracy and reaction time across all trials should positively correlate. This is in line with previous literature which states that an increase in reaction time should indicate more effortful conscious processing (Inzlicht & Schmeichel, 2012). However, there should be a difference in reaction time and accuracy between trial types, with incongruent trials having higher reaction time and lower accuracy scores than congruent trials, which indicates that incongruent trials involve response inhibition (De Ridder et al., 2018). Also, in line with De Ridder et al.'s (2018) findings, self-control in self-report trait measures should

be higher than self-control in the behavioural or response inhibition measures, illustrating the overestimation effect of self-report measures. Trait and state behavioural measures should also have a stronger correlation than trait and response inhibition scores. Overall, all self-control measures should correlate.

To reiterate, this study investigated the effect of workspace environment, specifically working-from-home (WFH) on employees' self-control. Self-control was measured through a multidimensional investigation using different measures to further investigate the nuances of measuring self-control through different tasks. Hypothesis 1 states that self-control scores should differ between workspace environments. Hypothesis 2 states that, in employees who predominantly WFH, a distracting workspace should reduce self-control scores when compared to a private workspace. Hypothesis 3 states that the three self-control measures (response inhibition, delay discounting and self-report) should correlate.

Method

Participants

Data from 169 participants was collected. However, 77 sets of data were incomplete (the participants completed less than 30% of the survey). Therefore, 92 participants were included in the final analysis. The mean age of participants was just under 30 years old (M = 29.83, SD = 10.66). Of these participants, 58 identified as females, 28 males, 2 non-binary and 4 preferred not to report their gender identity. Participants were from a range of ethnic groups; 36 identified as NZ European, 12 Mixed European, 11 Asian, 10 European and 14 reported their ethnicity as other. 2-3 participants each reported their ethnicity as either Pacific Island, African American, or Middle Eastern. Participants' average household income last year was around $105,000 ($M$ = 104,940, SD = 73.87), they had on average six and a half hours of sleep last night (M = 6.55, SD = 1.74), and they worked an average of two and a half days per week (M = 2.66, SD = 1.00). Participants who reported that they worked from home all or some of the time, worked an average of just under three and a half days per week at home (M = 3.44, SD = 1.67).

Materials

The online survey included four sections: the demographics/ motivation scale, response inhibition tasks, delay discounting task and Brief Self-Control Scale (BSCS). Self-control was measured in four ways: state- actual behaviour, state-hypothetical behaviour and trait- self-report. State- actual behaviour was measured using the Squared Response Inhibition Tasks created by Burgoyne et al. (2023). State-hypothetical behaviour was measured using a Monetary Delay Discounting Task (Koffarnus & Bickel, 2014), and the BSCS (Maloney et al., 2012) was used as trait- self-report measure.

The demographic and motivation scale asked several demographic questions measuring age, gender identity, ethnicity, household income, hours of sleep last night,

workspace environment, weekly working hours and when participants last had work. Workspace environment was measured using a modified version of the Open-Plan Office question from research by Weziak-Bialowolska et al. (2018). Participants were asked what space they work in during their normal working hours, with response options of: an open-plan office, private office, WFH and hybrid. A response of hybrid environment asked participants how many days they worked from home. WFH and hybrid responses asked participants where at home they usually worked (e.g. dedicated office space, lounge, dining room, etc.). This line of questions aimed to collect detailed information about the type of environment employees work in. The demographic section also included a question on motivation for the response inhibition tasks. Participants were asked how motivated they were to get a high score on the "cognitive performance tasks". Motivation for the response inhibition tasks was attempted to be increased by reporting to participants that they would only get the chance to win a gift voucher if they got a high score. This was intended to increase motivation, focus and attention.

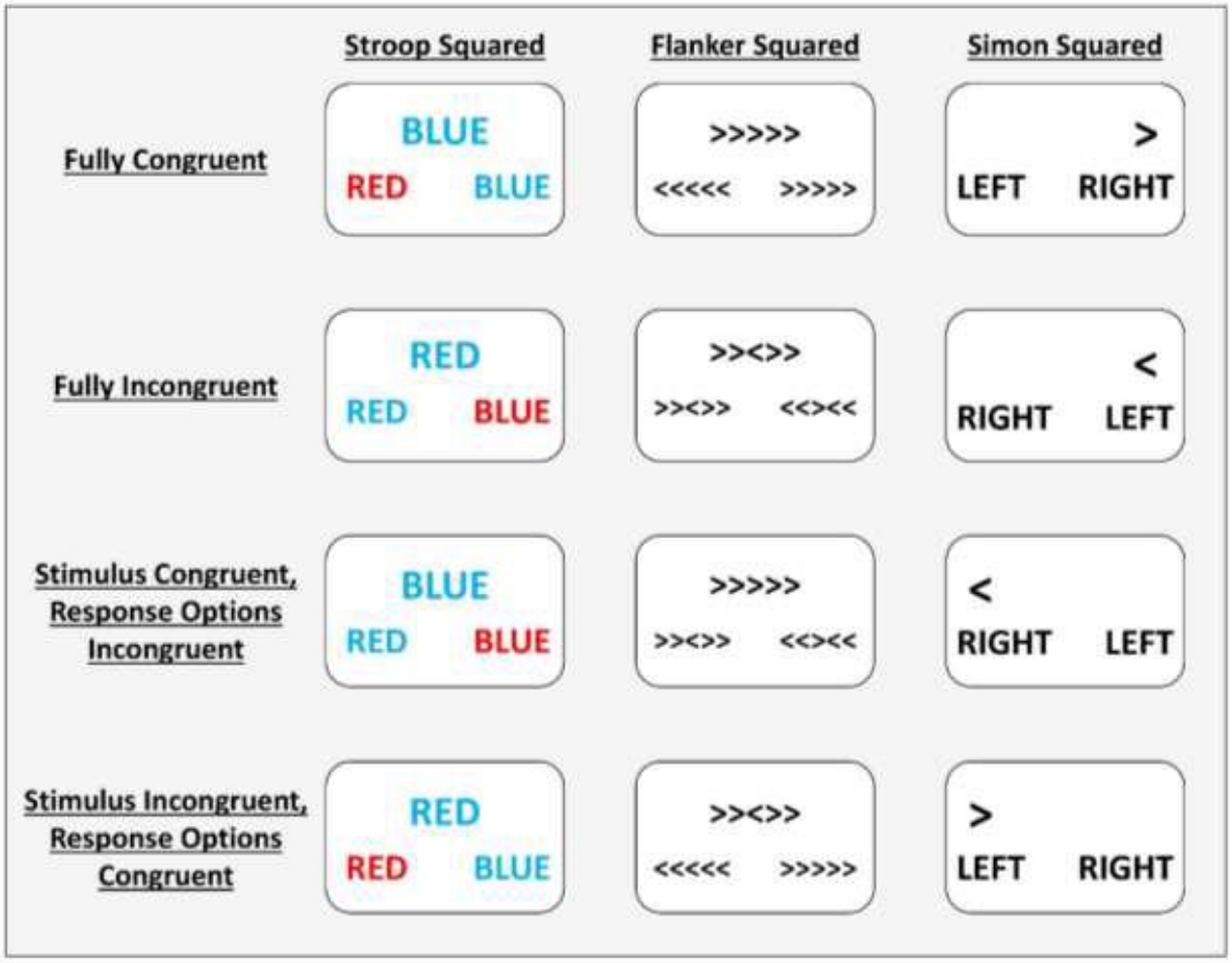
Squared Response Inhibition Tasks

The squared response inhibition tasks were taken from Burgoyne et al. (2023). These are squared versions of the Stroop, Flanker and Simon tasks. These three different tasks measure response inhibition and are therefore included as a measure of state- actual self-control behaviour. The Stroop task asks participants to indicate what colour a word is written in while ignoring the colour the word spells (e.g., the stimulus BLUE would have a correct answer of red). The Flanker task presents participants with a set of five arrows (e.g., < < > < <) and asks them to select the response option arrows where the four 'flanking' arrows are pointing the same direction as the middle arrow from the question (e.g., > > < > > would be the correct response). The Simon task presents participants with an arrow on one side of their screen (e.g., < on the right side of their screen) and asks them to indicate which way the

arrow is pointing and ignore the side of the screen it is on (e.g., left would be the correct response). Trials may be congruent, where the distracting and target stimuli are the same (e.g., BLUE), and incongruent, where the distracting stimuli is conflicting the target stimuli (e.g., BLUE). The squared versions of these tasks included two extra trial types: ‘stimulus congruent, response incongruent’ and ‘stimulus incongruent, response congruent’. These are termed ‘Squared’ trials and are more difficult when compared to incongruent trials (Burgoyne et al., 2023). Trial types for each task are illustrated in Figure 2. Each participant was first presented with instructions on the task, then completed a practice question with detailed feedback before starting the task. After selecting their chosen answer, participants were given feedback on whether they answered the question correctly. Participants' choice of answer (correct or incorrect) was collected as a measure of accuracy, and the number of seconds participants took to select their answer was also collected as a measure of reaction time.

Figure 2

Squared Response Inhibition Tasks Trial Type Examples



Delay Discounting Task

The delay discounting task was administered as a state-hypothetical measure of self-control behaviour. The measure used is described in Koffarnus and Bickel (2014), where participants have a series of questions asking whether they would prefer to receive a hypothetical smaller amount of money immediately (e.g. $100 now) or wait a specified length of time for a larger amount (e.g. $1,000 in one month). The reward amounts and delays to the larger reward were changed based on participants' response to the previous question. Choosing the larger-later (LL) reward in this task is deemed self-controlled, whereas choosing the smaller-sooner (SS) reward is more impulsive. The SS and LL amounts

started at $500 and $1,000 respectively, with four delays to the larger later reward included: 1 month, 6 months, 1 year and 3 years. Each delay included 7 trials. In line with Koffarnus and Bickel's (2014) study, an adjusting amount procedure was used where, if the SS option was chosen, its value was decreased in the next trial. If the LL option was chosen, the value of the SS option increased in the next trial. The first adjusting amount for each delay was $250 (i.e. the first trial had an SS of $250, and an LL of $1,000), this amount was halved in subsequent trials.

The data from this task was used to calculate a discounting rate which quantifies how participants choices are affected by reward size and delay. High reliability and validity for this task have been reported (Kirby & Marakovitch, 1996). Once data were collected, an indifference point was calculated for each participant, which reflects the average amount at which participants preference switches from the smaller, immediate reward to the larger, later reward (e.g., Rachlin et al., 1991). Using this indifference point, three theoretical models of discounting (hyperbolic, exponential,and hyperboloid) were fit to the data to determine which model fit the data for participants better. According to Odum (2011), the hyperbolic model refers to the fact that shorter delays decrease the value of a reward proportionally more so than longer delays. The exponential model predicts that the subjective value of a reward will decrease by a fixed proportion for each unit of time within the delay. However, these models tend to overpredict subjective value at shorter delays and underpredict at longer delays for human data. The two-parameter hyperboloid model addresses this issue by including a free parameter which reflects individual differences in sensitivity to (or scaling of) delay and/or amount (McKerchar et al., 2009). Overall, previous research generally agrees that a two-parameter model of discounting fits human data better (McKerchar et al., 2009; Odum, 2011).

Trait Self-Control Questionnaire

The Brief Self-Control Scale (BSCS) was the final task for participants to complete, where participants were asked questions about how self-controlled they felt they are in everyday life (Maloney et al., 2012). Higher overall scores indicate better domain-general self-control across restraint and impulsivity domains. Two additional questions were added from previous versions of the Self-Control Scale as measures of self-control planning, which asked participants to indicate how well they utilized adjusting their environment or future actions to reduce self-control dilemmas in the future. Past studies have shown the scale has high validity and reliability. For example, Tangney et al. (2004) found high internal consistency for the BSCS ($\alpha = .83$). This scale has also previously been used as a measure of dispositional self-control in workplace environments (e.g., Fedele & Converse, 2024), adding to its validity in this context.

Design/ Procedure

A cross-sectional, investigative study was conducted through an online survey distributed on Qualtrics. Results were anonymized and confidential. Once opening the anonymous link to the survey, participants were presented with an information sheet and consent question. Then, they completed the demographics/ motivation questionnaire. Next, the response inhibition tasks were presented, followed by the delay discounting task. Finally, participants completed the BSCS and were debriefed before submitting.

At the survey's completion, participants were asked to provide their email address (separated from their data) to go in the draw to win one of five $100 gift vouchers. Participants were also given the option to go to a link where the study results would be posted after the report's conclusion and submission.

Data Analysis

Based on their response to the Workspace question, participants were split into either the Private in-person ($N = 5$), Open plan in-person ($N = 38$), Work-From-Home (WFH) ($N = 30$), Hybrid ($N = 8$), or Other ($N = 12$) workspace categories. As participant numbers for some groups were very small, some workspace groups were combined for analyses. Both in-person groups were combined, and hybrid and other groups were also combined. The final workspace groups included in analysis were: In-Person ($N = 43$), WFH ($N = 30$) and Hybrid/Other ($N = 20$).

When participants last worked was measured using six categories from "I am completing this during my workday", to "5 or more days ago". As participant numbers were low, to meet minimum sample requirements for statistical analyses participants were grouped into three groups, based on their responses. Participants who reported that they were completing the survey during their workday were left as an individual group ($N = 27$), participants who reported last working yesterday or one day ago were combined into one group ($N = 21$), and all other participants were assigned to the final group (last worked 2+ days ago) ($N = 23$).

Another grouping variable, distractibility, was also calculated during initial analysis. Distractibility groups included: private WFH/ in-person ($N = 21$), distracting in-person ($N = 32$) and distracting WFH ($N = 26$). If participants indicated that they worked in a private office at a company-owned premises or at home, they were assigned to the first group. If they indicated they worked in an open-plan office in a company owned premises, they were assigned to the second group. Finally, if they indicated they worked from home in any space other than a dedicated office, they were assigned to the last group.

For the response inhibition tasks, two measures were collected. Reaction time and accuracy scores for each participant were measured for each trial. These were averaged across trial types (congruent, incongruent and squared). The Stimulus Congruent, Response Incongruent and Stimulus Incongruent, Response Congruent trial type's scores were averaged to create the squared trial type. Reaction time was measured in seconds and accuracy was measured as percentage correct. A lower reaction time and higher accuracy score indicates better response inhibition ability and, therefore, better self-control (Burgoyne et al., 2023). Overall accuracy was considered as the main outcome measure of self-control, with higher scores indicating higher self-control.

For the delay discounting task, a measure of impulsivity was calculated using the data from the delay discounting measure of self-control. This was fit to three models of delay discounting to determine the best fit for each participants data. Overall, the exponential model (Equation 1) best fit the most participants ($N = 46$), followed by hyperbolic (Equation 2) ($N = 13$) and hyperboloid (Equation 3) ($N = 6$). However, no one model fit all participants data the best, therefore it was determined that an atheoretical/ model-free measure of impulsivity, Area Under the Curve (AUC), would be used in analysis. To calculate an AUC value for each participant, delays and indifference points were first normalized to a proportion of the maximum value, they were then added to the AUC equation (Equation 4). AUC values can range from 1 (always chose the LL option) to 0 (always chose the SS option). Therefore, larger AUC values indicate more self-control.

Equation 1.

$$V = A/(1 + kD)$$

Note. the present value of a reward (V, the indifference point) is equal to the amount of the reward (A) divided by the delay to the reward (D). *k* is a scaling factor which describes how delay affects value. This is a free parameter, determined from the fit of the model to the data (Odum, 2011).

Equation 2.

$$V = Ae^{-kD}$$

Note. *e* is the base of the natural logarithm, approximately equal to 2.718. For each time unit of delay, the value of reward will decrease by a fixed amount (Odum, 2011).

Equation 3.

$$V = A/(1+kD)^{s}$$

Note. s is a free parameter that reflects individual differences in the scaling of delay and/or amount (McKerchar et al., 2009).

Equation 4.

$$x_2 - x_1\ [(y_1 + y_2)/2]$$

Note. x_1 and x_2 are successive delays and y_1 and y_2 are the indifference points associated with those delays (see Myerson et al., 2001 for more detail).

Results

Demographic Analyses Between Workspace Groups

Age, income, sleep and motivation scores were compared between groups to determine whether each group was representative of demographic characteristics. As assessed by Shapiro-Wilk values, age, sleep and motivation scores were not found to be normally distributed between groups ($p < .05$). However, income was found to be normally distributed ($p > .05$).

A Kruskal-Wallis H test was run to determine if there were differences in age, sleep and motivation scores between workspace environment groups. Distributions of age were not similar for all groups, as assessed by visual inspection of a boxplot. The mean rank of age was not statistically significantly different between groups, $X^2(2) = 2.06$, $p = .36$. Distributions of sleep scores were similar for all groups, as assessed by visual inspection of a boxplot. Median sleep scores were not found to be statistically significant between groups $X^2(2) = 1.33$, $p = .52$. Distributions of motivation were not similar for all groups, as assessed by visual inspection of a boxplot. The mean rank of motivation was not statistically significantly different between groups, $X^2(2) = .57$, $p = .75$.

A one-way ANOVA was run to determine whether there was a difference in household income between groups. No statistically significant differences were found, $F(2, 87) = 1.06$, $p = .35$.

Chi-Square Tests were run between workspace groups and gender, ethnicity and weekly working hours. Some expected cell frequency scores in all Chi-Square Tests were not greater than five, however this is expected given the small sample sizes for some of the demographic groups. The analyses revealed no significant differences in gender ($X^2(6) =$

8.04, $p = .24$), ethnicity ($X^2(16) = 25.47$, $p = .06$), or weekly working hours ($X^2(6) = 11.70$, $p = .07$) between workspace groups.

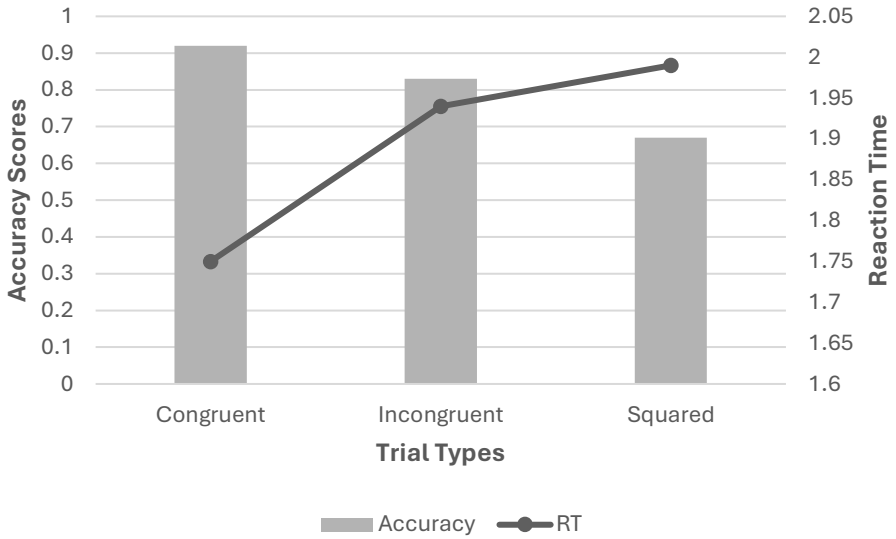
Self-Control Measures

Response Inhibition Task

Reaction time and accuracy scores for each trial type were not normally distributed, as assessed by Shapiro-Wilk values ($p < .05$). Therefore, A Kruskal-Wallis H test was run to determine if there were differences in reaction time and accuracy scores between the three squared task trial types: congruent, incongruent and squared (see Figure 2). Distributions of reaction time and accuracy scores were similar for all trial types, as assessed by visual inspection of a boxplot. Median reaction time increased from congruent (*Mdn* = 1.75), to incongruent (*Mdn* = 1.94), to squared (*Mdn* = 1.99) trial types. Median accuracy scores decreased from congruent (*Mdn* = .92), to incongruent (*Mdn* = .83), to squared (*Mdn* = .67) trial types. Median reaction times were not statistically significantly different between trial types, $H(2) = 5.30$, $p = .07$. Median accuracy scores were statistically significantly different between trial types, $H(2) = 39.38$, $p < .001$. These results are illustrated in Figure 3.

Figure 3

Median Reaction Time and Accuracy Scores for Response Inhibition Task Trial Types



Brief Self-Control Scale

A Cronbach's Alpha was calculated for the 10-items of the BSCS to determine its internal reliability. At first calculation, the Cronbach's Alpha was very poor (α =.21). However, Item-Total Statistics indicated that items six and eight could be deleted to increase reliability. Although previous uses of the BSCS have not found issues with these questions (Maloney et al., 2012), item six ("Pleasure and fun *sometimes* keep me from getting work done") and eight ("*Sometimes* I can't stop myself from doing something, even if I know it's wrong") were the only two statements which used the word "sometimes". This is compared to the other statements which were more definitive (e.g., "I am able to work effectively towards long term goals"). This may explain why these items reduced reliability and point to the conclusion that future uses of the BSCS should change their wording to remove the ambiguity. After deleting these items, the Cronbach's Alpha was acceptable (α = .69), but still low. Item's six and eight were not used in the final BSCS score for participants.

Correlations Between Self-Control Measures

Analysis of the three self-control measures used in this study indicated that none were normally distributed, as assessed by Shapiro-Wilk values ($p < .05$). Therefore, a Spearman's rank-order correlation was run to assess whether the different self-control measures correlate. There was a significant, moderate positive correlation between accuracy and reaction time scores in the response inhibition tasks (r_s (89) = .49, $p < .001$) and a significant, low positive correlation between accuracy and AUC values (r_s (89) = .24, $p = .02$). No significant correlations existed between AUC value and reaction time (r_s (88) = .16, $p = .13$), BSCS score and reaction time (r_s (70) = .08, $p = .48$), BSCS score and accuracy score (r_s (88) = -.12, $p = .31$), or BSCS score and AUC value (r_s (88) = -.05, $p = .67$).

Correlations Between Self-Control and Other Variables

Regression analyses were calculated for each self-control measure. Correlation outputs from these analyses indicated several significant relationships between variables. Overall accuracy had a moderate, positive correlation with sleep and low, positive correlation with age. AUC values had a moderate, negative correlation with motivation. BSCS scores had a low, negative correlation with motivation. Motivation had a low, positive correlation with age. Finally, age had a moderate, positive correlation with income. These results are illustrated in Table 1.

Table 1

Pearson Correlations Between Overall Accuracy, AUC Value and BSCS Scores and Motivation, Sleep and Age

	Overall Accuracy	AUC Value	BSCS Score	Motivation	Sleep	Age
			Pearson Correlation			
Motivation	-.07	-.30*	-.11*	.		
Sleep	.38**	-.01	-.84	.01	.	
Age	.23*	.08	.19	-.22*	.19	.
Income	.00	.04	.05	-.06	.04	.36**

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

Self-Control in the Workplace

Assumption Testing

Multiple Linear Regression (MLR) analyses were run for each self-control measure; overall accuracy, AUC values and BSCS scores. Firstly, assumption testing was run to determine whether each set of variables could be investigated using this analysis. The assumptions tested for each analysis were: independence of observations, homoscedasticity, multicollinearity and outliers/ influential points. The Durbin-Watson statistic was calculated for each regression analysis to test for first order autocorrelation between observations. All analyses indicated that observations were independent, with statistics close to a value of 2 for MLR's for accuracy (2.05), AUC values (1.91) and BSCS (2.48). Linearity was assessed by visual inspection of partial regression plots and a plot of studentized residuals against the predicted values, for each regression. All plots showed data arranged in a somewhat horizontal band, therefore, linearity was assumed. This was not completed for categorical

variables included. The scatterplot of studentized residuals against predicted values also provided visual interpretation of homoscedasticity. The spread of residuals did not increase or decrease (funnel- or fan-shaped distributions) across the predicted values for any of the three MLR's. Multicollinearity was assessed using tolerance values calculated for each MLR. All tolerance values for each analysis were greater than 0.1.

Outliers, leverage and influential points were assessed for each participant in each MLR. Cook's distance, studentized deleted residuals (SDR) and leverage values were used to test this assumption. For the accuracy and AUC analyses there were no participants with Cook's distance values above 1, however one participant in the BSCS analysis had a value above 1. This participant was still included as they did not show abnormal SDR or tolerance values. For the BSCS analysis, no participant had SDR values ±3 standard deviations or leverage values greater than 2. For the accuracy analysis, two participants had studentized deleted residuals greater than -3 standard deviations, and six participants had leverage values greater than 0.2. However, no participant had both a studentized deleted residual -3 standard deviations and leverage value greater than 0.2, therefore all participants data was included in analysis. For the AUC value analysis, six participants had leverage values greater than 0.2, however none were above 0.5, therefore these participants data was still included in the final analysis. Linearity was not assessed due to regression's tendency to be robust to non-normality. Overall, assumption testing indicated that, for the dependent variables accuracy scores, AUC values and BSCS scores, regression analyses could be completed.

Self-Control Regression Analyses

The multiple regression model indicated that the predictors did not statistically significantly predict accuracy ($F(8, 65) = 1.99$, $p = .06$, adj. $R^2 = 9.8$), AUC value ($F(8, 65) = 1.04$, $p = .42$, adj. $R^2 = .00$), or BSCS scores ($F(8, 50) = 1.49$, $p = .19$, adj. $R^2 = .06$). The only significant predictors were sleep for accuracy ($p = .003$) and motivation for AUC value ($p =$

.03). Regression coefficients and standard errors for each regression analysis can be found in Tables 2 to 4.

Table 2

Multiple Regression Results for Overall Accuracy on the Squared Response Inhibition Tasks

Accuracy		95% CI for *B*						
	B	LL	UL	*SE B*	*β*	*p*	R^2	ΔR^2
Model							.20	.10
(Constant)	.10	-.34	.54	.22		.66		
Workspace	.00	-.09	.09	.04	.01	.95		
Distractibility	.04	-.03	.12	.04	.13	.26		
Motivation	-.01	-.06	.05	.03	-.02	.85		
Sleep	.06*	.02	.09	.02	.36*	.00		
Age	.01	-.00	.01	.00	.23	.08		
Gender	.02	-.06	.10	.04	.06	.61		
Ethnicity	.00	-.01	.02	.01	.01	.93		
Income	.00	-.00	.00	.00	-.10	.43		

* $p < .05$

Table 3

Multiple Regression Results for AUC Values

AUC Values		95% CI for *B*						
	B	LL	UL	*SE B*	*β*	*p*	R^2	ΔR^2
Model							*.11*	*.00*
(Constant)	*.30*	*-.28*	*.89*	*.29*		*.10*		
Workspace	*.05*	*-.05*	*.15*	*.05*	*.12*	*.77*		
Distractibility	*.01*	*-.09*	*.11*	*.05*	*.02*	*.69*		
Motivation	*.07**	*-.14*	*-.01*	*.03*	*-.28**	*.03*		
Sleep	*.00*	*-.05*	*.05*	*.02*	*.00*	*.94*		
Age	*.00*	*-.01*	*.01*	*.00*	*.02*	*.88*		
Gender	*.03*	*-.07*	*.14*	*.05*	*.08*	*.87*		
Ethnicity	*.00*	*-.02*	*.02*	*.01*	*-.04*	*.78*		
Income	*.00*	*-.07*	*.14*	*.05*	*.08*	*.63*		

* $p < .05$

Table 4

Multiple Regression Results for BSCS Scores

BSCS Scores		95% CI for *B*						
	B	LL	UL	*SE B*	*β*	*p*	R^2	ΔR^2
Model							*.19*	*.06*
(Constant)	*30.62***	*22.89*	*38.35*	*3.85*		*<.001*		
Workspace	*-.09*	*-1.38*	*1.21*	*.64*	*-.02*	*.96*		
Distractibility	*-.70*	*-1.93*	*.53*	*.61*	*-.16*	*.54*		
Motivation	*.78*	*.02*	*1.54*	*.38*	*.27*	*.07*		
Sleep	*-.28*	*-.87*	*.31*	*.29*	*-.12*	*.50*		
Age	*.07*	*-.02*	*.15*	*.04*	*.22*	*.06*		
Gender	*.16*	*-1.23*	*1.55*	*.69*	*.03*	*.81*		
Ethnicity	*-.18*	*-.40*	*.05*	*.11*	*-.20*	*.06*		
Income	*.00*	*-.01*	*.01*	*.01*	*-.02*	*.07*		

Discussion

The aim of the current study was to determine whether self-control, investigated using three different measures, differed between employees who worked in different workspace environments (private in-person, open plan in-person, Work-From-Home (WFH), hybrid, and other). Statistical analyses revealed no effect of workspace environment on self-control. This does not support Hypotheses 1 and 2. Hypothesis 3 was partially supported, with correlations between some measures of self-control, but not others. Some relationships were also discovered between sleep, motivation and self-control. Sleep had a positive relationship with accuracy scores and motivation had a negative relationship with AUC values and BSCS scores. Finally, age was found to have positive relationships with accuracy, motivation and income. These findings suggest that the effect of workspace environment on self-control may be more nuanced than originally anticipated.

Does Workspace Environment Affect Self-Control?

Findings from this study indicate that the workspace environment does not influence employee's self-control, inconsistent with Hypothesis 1. Previous literature has provided evidence as to why no significant difference was found (Duckworth et al., 2016; Inzlicht & Schmeichel, 2012; Moon et al., 2020). It has been found that increased distractibility and intrusions in the workplace decreased employee's self-control (Moon et al., 2020). The effect of distractions on self-control is corroborated by the process model of self-control, which explains that distracting stimuli in the environment increase the chance of an individual experiencing a self-control dilemma. During a self-control dilemma, the ego-depletion model states that an individual will draw on a reservoir to make the self-controlled choice. Exhibiting more self-controlled behaviour will, therefore, lead to less ability to exert self-control in the future. Increasing distracting stimuli provides more opportunity for self-

controlled dilemmas to arise, depleting self-control reserves. Therefore, increased distracting stimuli will decrease self-control.

However, research such as that of Bridger and Brasher (2011) indicates that privacy and control are also important mediators between the effect of workspace environment on self-control. Increased privacy and control over the environment have been found to increase self-control and job performance. Therefore, it could be assumed that, although a WFH environment increases distractibility, it decreases intrusions and increases privacy and control. This may explain why no significant differences were found in this study as distractibility, privacy and control variables may, in effect, cancel each other out in a WFH environment. However, if this is the case, then a difference should have been found between in-person open-plan and private workspaces, with employees working in open-plan workspaces having decreased self-control. Similarly, an effect should have been found on different WFH environments on self-control. This leads to the results for Hypothesis 2.

Does the type of WFH environment affect self-control?

Hypothesis 2 stated that self-control scores will be lower in employees who WFH in a distracting environment (e.g., at a bedroom desk), versus a private environment (dedicated office space). Although previous research has indicated that distractions decrease self-control, the importance of privacy and control has also been illustrated. Therefore, it was expected that a private WFH environment would be the best environment to both lower distractibility and provide more privacy and control. The findings from this study did not support this hypothesis. No difference in self-control scores was found between employees who work in a private or distracting environment. This leads to the conclusion that the environment in which employees choose to WFH has no effect on their self-control, further indicating that distracting stimuli in the workspace has no effect on self-control. However, as with the conclusions from Hypothesis 1, this may be due to mediating variables, such as privacy and

control as these were not controlled for in the current study. If privacy and control had been measured, these assumptions could have been tested for each group. Furthermore, if more detail had been collected on the specific environments in which employees work, this could have contributed to understanding whether specific factors within the workspace contribute to differences in self-control, and what these might be.

Do Measures of Self-Control Correlate?

Regarding the measurement of self-control, De Ridder et al. (2018) explain that many different methods have been used in previous research. This study looked to add evidence to literature on delay discounting (Koffarnus & Bickel, 2014) and the new squared response inhibition task types created by Burgoyne et al. (2023). It also hoped to give further evidence to literature which has found correlations between different self-control measures, specifically state actual and hypothetical behaviour and trait self-reports. This was Hypothesis 3. When fitting the hyperbolic, exponential and hyperboloid models to the delay discounting data, it was assumed that the hyperboloid model would fit the data the best, as previous research has indicated that a two-parameter model fits human data better than a one-parameter (hyperbolic/ exponential) (McKerchar et al., 2009; Odum, 2011). However, delay discounting data from this study indicated that most participants fit the exponential model better. This may be due to the number of delays included in this version of the delay discounting task. In other examples of the monetary delay discounting task, trials include six or more delays to the larger reward (Koffarnus & Bickel, 2014). In the task used in this study, only four delays were used, resulting in less data to fit to the models. This could be a possible explanation for the exponential model fitting this data the best.

In outcomes from the squared response inhibition tasks, accuracy scores were found to increase from congruent, to incongruent, to squared trial types as expected. In correlational analyses, reaction time and accuracy were found to positively correlate, indicating that as

reaction time increased, so did accuracy scores. These findings lend evidence to the use of the Squared tasks to measure response inhibition. However, reaction times did not differ between trial types. As congruent trials involve more automatic responding, and squared involve more conscious response inhibition and responding, it was expected that reaction times would significantly increase across trials. These results partially support initial findings from Burgoyne et al. (2023), however they also highlight the need for further research to investigate these measures.

For Hypothesis 3, it was assumed that AUC values, response inhibition scores and BSCS scores would correlate, as discovered in previous studies (De Ridder et al., 2018), however this was not found. There was a low correlation between AUC values and accuracy scores on the response inhibition tasks. As higher AUC values indicate that participants were more self-controlled in the state- hypothetical task, the positive correlation indicates that better self-control in a monetary delay discounting task is related to better response inhibition. Combining this with results from specific response inhibition trials may indicate that state- hypothetical and response inhibition accuracy measure the same construct and that this is self-control.

Inconsistent with previous literature, no relationships were found between BSCS scores and other self-control measures (De Ridder et al., 2018). Furthermore, the Cronbach's Alpha was very low originally. As discussed earlier, two items were removed to increase reliability. Future uses of the BSCS should reword these items to remove the ambiguous prompt "sometimes", which differentiated these items from the others. Although deleting these two items resulted in acceptable reliability, the Cronbach's alpha indicated that reliability was still low. This is somewhat surprising, as previous research has indicated that this is a reliable and valid measure of self-control (e.g., Maloney et al., 2012). However, feedback from participants indicated that some found it difficult to understand what the

questions were asking. Although they were asked to indicate how well each statement described them, participants reported that it was confusing, and they often forgot how they were meant to be rating each statement. For example, the wording of the question "Please indicate how well the following statements apply to you" could have been added to the beginning of each statement to remind participants of how they were meant to respond as some mentioned the response options from "Not well at all" to "Extremely well" confused them after reading the statements. Perhaps confusion on this scale resulted in participants responding inconsistently. This may also explain why the scale showed poor reliability.

The Role of Sleep, Motivation, and Demographics

Previous research has shown that sleep deprivation creates poor performance on response inhibition tasks, so it was assumed that hours of sleep would have a positive correlation with response inhibition accuracy scores (Pilcher et al., 2023). This was partially corroborated by the data as it was found that as hours of sleep increased, accuracy scores increased. No correlation between sleep and AUC values or BSCS scores existed, further providing evidence that sleep only affects response inhibition tasks. Results from previous research also indicated that increased motivation should increase self-control scores (Burgoyne et al., 2023). There was no relationship found between motivation and accuracy, which did not support previous research. However, motivation was found to have negative relationships with AUC values and BSCS scores. Therefore, as motivation increases, AUC values and BSCS scores decrease, indicating a decrease in self-control. This is an interesting finding as it was not expected that motivation would influence other self-control measures. The original motivation question asked participants how motivated they were to do well in the "cognitive performance" tasks (response inhibition tasks); therefore it was not expected to have an effect on the delay discounting and BSCS measures. This could point to the conclusion that participants who were motivated to get a high score in the response inhibition

tasks, had less trait and monetary self-control. Perhaps individuals who view themselves as less self-controlled or have less self-control over hypothetical situations, are more motivated to achieve in performance situations. This could point to an influence of self-esteem or self-efficacy, which could be used as covariates in future research on the effect of self-control. Previous research has found a mediating effect of self-efficacy on the relationship between self-control and positive life outcomes, such as academic performance (Kurtyilmaz et al., 2023). Other studies have found a relationship between general self-control and social self-efficacy (Levine, 1990). Combining this with the findings from the current study points to a need for future research to look at the mediating effect of self-efficacy on self-control and motivation.

Finally, incidental demographic results were found during analysis. Age was found to correlate with several other variables. It was found that as age increased, accuracy, motivation and income increased. This indicates that older participants had higher accuracy scores, were more motivated to do well on the response inhibition tasks and had higher income. This is in line with previous research that has found that as age increases, accuracy in response inhibition tasks increases (Parimoo et al., 2024). Income findings were expected as often older individuals typically earn more due to experience. These findings could also point to alternate motivations driving participants' scores on the motivation question. Perhaps older participants were more interested or determined to get a higher score for another reason, such as being able to confirm that they had good cognitive performance. More research could be done to further investigate this and understand the underlying reasons for this relationship. Despite these findings, conclusions regarding the results of this study should consider limitations that exist within the study design and analyses.

Limitations and Future Research

Limitations of this study include both methodological and theoretical limitations. Firstly, the sample size was relatively small for this study, with only 93 participants included in the final analyses. Previous research has used sample sizes from 200 to 1,000 (E.g., Moffitt et al., 2011; Pener-Tessler et al., 2022). Small sample sizes, especially those inconsistent with previous research, reduce the validity of a study (Faber & Fonseca, 2014). Therefore, these findings have reduced applicability to the wider population. Although only data from 92 participants were included in final analyses, data from 169 participants was collected, with a large majority being incomplete. This indicates that the survey used may not have been engaging enough to keep participants from exiting early and creates a high attrition rate. Data was also collected through convenience and snowball sampling, which could result in a bias in included participants' data.

Demographic characteristics also point to the sample being more representative of a part-time worker population, as the average number of days per week that participants worked was only two and a half. Previous research has indicated contradictory findings on the differences between part-time and full-time employees. Some indicate that part-time employees have different attitudes and job satisfaction in the workplace, when compared to full-time workers, and others have found contradictory evidence (Conway & Briner, 2002). However, as part-time employees spend less time at work, the workspace environment may have less of an impact on them. Conway and Briner (2002) provide evidence to this claim as they have indicated that part-time employees have different psychological contracts at work, when compared to full-time workers. This indicates that part-time workers are less likely to internalise the beliefs and psychological demands of the organisation in which they work. In other words, part-time employees' thoughts and beliefs within the workplace are different to those of full-time employees and Conway and Briner's (2002) study could indicate that these

employees are less psychologically invested in the workspace. Therefore, psychological or behavioural effects from workplace factors could be assumed to affect part-time employees less than full-time employees. Similarly, the ego depletion model of self-control states that the more self-control an individual uses, the less they will have for use in future (Baumeister et al., 1998). If employees are spending less hours at work, then they are less likely to have reduced self-control. As the participants in this study spent an average of just over two days at work per week, they have less time in a workspace environment. This may have led to the lack of an effect from workspace environment in this study. Should full-time employees be targeted or increased in future studies; this may show more of an effect of workspace environment.

Methodological limitations also exist through a cultural bias. Most participants identified as NZ European or mixed European, indicating that these results should be less applicable to diverse cultural backgrounds and ethnicities. Previous research has indicated that cultural differences may exist when studying self-control. For example, Hedden et al. (2008) discovered that East Asian participants showed greater attentional control in response inhibition tasks where they had to take contextual stimuli into account before responding, when compared to Western participants. The converse was true for tasks where the contextual stimuli had to be ignored and therefore acted as a distraction. This indicates that cultural differences may exist in certain self-control tasks, however this study did not control for cultural differences in participants. There was also an overrepresentation of females in this sample, with double the number of female participants as there were male participants, and very low numbers of non-binary/ diverse genders. Overall, these results point to the conclusion that this study's sample was very specifically over representative of part-time, European, female employees. Future studies should emphasise investigating the effect of workspace environment on a more diverse sample.

Measures used in this study were found to partially corroborate the theory that different measures of self-control correlate and, therefore, measure a similar construct. AUC values and accuracy scores correlated, however BSCS scores did not correlate with any other measure. Although this measure had previous research indicating high reliability and validity (Maloney et al., 2012), feedback from participants indicated that the BSCS was difficult to understand. The scale asked participants to respond to how well they thought each statement described them, however this prompt was only given at the top of the page of statements, rather than giving clear prompts with each statement (e.g., "'I am good at resisting temptation' How well does this statement describe you?"). Therefore, it is possible that rewording the BSCS would create more reliable results. The use of the BSCS brings another possible limitation. As it is a self-report scale, there is a possibility that it was not representative of true participant ability. This could lead to the conclusion that self-report measures of self-control do not accurately measure self-control ability, when compared to the measurement of actual behaviour. Future studies should seek to further investigate the difference between self-control measures and whether self-report scales are inaccurate, or whether they are simply measuring a different construct to that of other self-control measures.

Theoretical constraints also exist for this study. Firstly, during data collection there was no requirement for participants to be an office worker. Any employee could participate in the study, however the workspace environments explained as possible influences were typically only relevant to office workers. For example, one participant gave feedback that they were a lifeguard so worked outside in a pool, and was grouped into the 'Other' workspace environment. This study did not either constrain participants to only being office workers, nor did it include a workspace description fit for examining the detail of alternative workspaces. Mediating factors were also not considered in data collection. As discussed throughout this report, privacy and control have been identified as key influences in the effect

of workspace environment on self-control, however no measure was taken to control for these factors which may have influenced the results. Similarly, workspace environments were not adequately described by the workspace groupings used. If the workspace grouping question had included more diverse options, and mediating variables (e.g., privacy and control) been considered and controlled for, the results of this study may be different.

Future research is necessary to ameliorate limitations involved in this study and further investigate the effect of workspace environment on self-control. Firstly, a larger, more representative group of participants should be included to gain meaningful results. Consideration should be taken to both continue to include diverse self-control measures, but also consider other options for measuring trait self-control. Workspaces should have a clearer, more diverse definition and an effort should be made in future research to target specific working populations. This study may be more effective when applied to employees who share a common attribute, e.g., office workers from a specific company. Finally, measurements of mediating variables and greater workspace detail should be collected in future studies to ensure that variables which may mediate the relationship between workspace and self-control (such as privacy and control) are controlled for. More detail would be useful in describing employees' workspaces and the specific details that exist within these environments.

As this study did not find a relationship between working-from-home and self-control, it could be assumed that there is no effect of this workspace environment on self-control. However, another explanation for this finding could be that the effect of this unique workspace environment may not be on the construct of self-control, but another, broader construct. For example, research such as that of Mudra Rakshasa & Tong (2020) has found that isolation increases stress, which in turn increases risky decision-making in rats. This points to the consideration that mediating variables such as isolation and stress in employees

who WFH could influence a broader psychological construct, such as decision-making. Furthermore, it was discovered that motivation negatively influenced self-control scores on two scales. More research could be used to investigate the mediating effect of self-efficacy, motivation and self-control. Therefore, future research should focus on the interaction between workspace environment and self-control, and related mediating psychological constructs (e.g., privacy, control, stress and isolation).

Overall, this study indicated that state-hypothetical and state- actual measures of behaviour measure the same self-control phenomenon, however there may not be an effect of working-from-home on self-control. Future research should focus on the effect of specific factors within a WFH environment that may affect self-control. Limitations should be addressed to further provide accurate measures of self-control and workspace environment.

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Appendix A: Ethics Approval

Auckland University of Technology Ethics Committee (AUTEC)

15 August 2024

Stef Gomes-Ng
Faculty of Health and Environmental Sciences

Dear Stef

Re Ethics Application: **24/219 Self-Control in Work-From-Home Versus In-Person Employees.**

Thank you for your responses to AUTEC's conditions.

Your ethics application has been approved for three years until 15 August 2027.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC.
2. All public facing documents must have the AUTEC approval number and be of a high standard of spelling and grammar. Dates on the Information Sheet(s) and Consent Form(s) must be consistent.
3. Any amendments to the project must be approved by AUTEC prior to being implemented.
4. A progress report is due annually on the anniversary of the approval date.
5. A final report is due at the expiration of the approval period, or, upon completion of project.
6. Any serious or adverse events must be reported to AUTEC, this includes unforeseen issues that might affect continued ethical acceptability of the project.
7. AUTEC grants ethical approval only. You are responsible for obtaining management permission for access from any institution or organisation at which your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

The application number and title need to be referenced on all correspondence related to this project.

All forms are available online http://www.aut.ac.nz/research/researchethics

For any enquiries, please contact ethics@aut.ac.nz
(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: Wkp2922@autuni.ac.nz; Jay Wood

Appendix B: Participant Information Sheet

Participant Information Sheet

Date Information Sheet Produced:

5th July 2024

Project Title

The Effect of Workspace Environment on Self-Control.

Hello! My name is Tess Austin, and I am a student at AUT (Auckland University of Technology), currently completing my Bachelor of Arts (Honours) in Psychology. As part of my degree, I am conducting a research project investigating the effect of workplace environment on behaviour. I would like to invite you to take part in this survey, which will contribute to the completion of my degree.

What is the purpose of this research?

This research will explore how the environment you work in (e.g. working-from-home or at a company owned premise), and how different factors within that environment affect self-control. It will also contribute to completion of my Honours degree. The findings of this research may be used for academic publications and presentations.

How was I identified and why am I being invited to participate in this research?

You have been identified through online or paper advertising. I am aiming to recruit a large sample of employees who both work from home, have flexible working arrangements or work primarily in-office. People over the age of 16 are invited to take part.

How do I agree to participate in this research?

Your participation in this research is voluntary (it is your choice) and whether you choose to participate will neither advantage nor disadvantage you. You can withdraw from the study at any time. This survey is anonymous and no personally identifiable data will be collected.

Because this research is anonymous, we will not be asking you to sign a consent form (this would remove anonymity). Instead, completion of this survey indicates consent to participate in this research.

What will happen in this research?

The survey will include four sections. Firstly, you will be asked some brief demographic questions, then you will be asked to complete a cognitive performance task, a monetary decision-making questionnaire and a questionnaire about your habits. This survey can be completed anywhere; however, we do ask that your answers are not influenced by other people.

What are the discomforts and risks?

No discomforts or risks have been identified in the proposal for this study.

How will these discomforts and risks be alleviated?

No discomfort or risk has been identified when taking part in this study.

What are the benefits?

This research will contribute towards my Bachelor of Arts (Honours) qualification. I hope that it will also answer questions about the effect of workspace environment on self-control in New Zealand adults.

How will my privacy be protected?

All data will be stored anonymously, meaning that your identity will not be linked to your data. If you do well in the cognitive performance task, you will be given the opportunity to provide your email address to be put into the draw to win one of five $100 gift vouchers. Your email address will be stored separately from your survey data to ensure that it cannot be linked to your data.

What are the costs of participating in this research?

The survey should take between 20-25 minutes to complete.

What opportunity do I have to consider this invitation?

The survey will be available until 30th September 2024.

Will I receive feedback on the results of this research?

If you would like a copy of the findings from this study, you can visit this link: https://aut.au1.qualtrics.com/jfe/form/SV_b2Q2kdVHssUeRmK . Once the report has been finalised, a copy of the findings will be available at this link.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, *Stef Gomes-Ng. email:* stef.gomes-ng@aut.ac.nz.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, *ethics@aut.ac.nz* , (+649) 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Tess Austin – wkp2922@autuni.ac.nz

Project Supervisor Contact Details:

Stef Gomes-Ng – stef.gomes-ng@aut.ac.nz

Jay Wood – jay.wood@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, AUTEC Reference number *type the reference number*.