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HANDLING COGNITIVE STRAIN MID-WORKDAY: FEASIBILITY AND INITIAL EFFECTIVENESS OF A SELF-REGULATION PROTOCOL

Master's Thesis

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Abstract

Knowledge workers routinely face competing priorities, time pressure, and high workloads, which impair their capacity for deliberate self-regulation and may reinforce automatic but ineffective coping responses. This master's thesis introduces a four-step self-regulation protocol (SNAP), designed to be applied in the workplace at moments of cognitive strain, without requiring withdrawal from the ongoing task.

The aim of the study was to evaluate the feasibility of SNAP in the workplace and to understand its preliminary effects in a sample of Estonian knowledge workers (N = 14). A three-day daily-prompt study with pre- and post-surveys collected data on perceived cognitive clarity, task completion, task-based performance, and well-being, followed by six semi-structured interviews analysed using reflexive thematic analysis

SNAP use exceeded the pre-registered feasibility threshold, indicating that this type of in-task intervention can fit within knowledge work context. SNAP use did not predict improvements in same-occasion cognitive clarity or intention-behaviour gap, but pre-post comparisons revealed positive directional trends in task-based performance and well-being. Qualitatively, participants described the protocol's primary value as a metacognitive shift, highlighting their capacity to notice automatic avoidance behaviour at the moment it arose and to make a deliberate choice about their priorities.

The findings point to a mismatch between the mechanism and the measure, as the fixed-time ratings did not capture the within-episode attentional shift that participants described as the working mechanism of SNAP. Future studies should incorporate a control condition and a longer practice period.

Lühikokkuvõte

Teadmustöötajad puutuvad igapäevatöös kokku paljude prioriteetide, ajasurve ja kõrge töökoormusega, mis pärsib nende teadlikku eneseregulatsiooni, potentsiaalselt soodustades automaatseid, kuid ebatõhusaid toimetulekustrateegiaid. Käesolev magistritöö käsitleb neljasammulise eneseregulatsiooni protokolli (SNAP) rakendamist töökeskkonnas, kognitiivse pinge hetkedel, ilma tööülesandest eemaldumata.

Töö eesmärk oli hinnata SNAP-i rakendatavust töökeskkonnas ja mõista selle esmaseid mõjusid Eesti teadmustöötajate valimi näitel. Viiepäevases uuringus (N = 14) koguti andmeid tajutud kognitiivse selguse, kavatsuse–käitumise lõhe, ülesandepõhise soorituse ja heaolu kohta ning viidi läbi kuus poolstruktureeritud intervjuud, mida analüüsiti refleksiivse temaatilise analüüsi meetodil.

SNAP-i kasutamise määr ületas eelregistreeritud lävendi, mis kinnitab, et sedalaadi sekkumine võiks töökeskkonda sobida. Saime teada, et SNAP-i kasutamine ei ennustanud kognitiivse selguse paranemist ja kavatsuse-käitumise lõhe vähenemist, kuid uuringu alguse ja lõpuküsimustike kaudu ilmnesid positiivse suunaga trendid ülesandepõhises soorituses ja heaolus. Kvalitatiivselt kirjeldasid osalejad protokolli peamist väärtust metakognitiivse nihke kaudu, tuues välja võimet märgata automaatset vältimiskäitumist selle tekkimise hetkel ja teha teadlik valik oma prioriteetide osas.

Tulemused viitavad mõõtmisvahendi ja sekkumismehhanismi sobimatusele, mis tähendab, et fikseeritud aegadel tehtud hinnangud ei taba episoodilist tähelepanu, mida osalejad SNAP-i toimena kirjeldasid. Edasised uuringud peaksid rakendama kontrolltingimust ja pikemat harjutusperioodi.

Executive Summary

Most people know the feeling of sitting down to work on something important and then, within twenty minutes, re-reading the same paragraph, checking messages that were just checked, or doing something small and easy instead of the thing that matters. This is caused by cognitive strain. The conditions that create cognitive strain, like fragmented work, sustained pressure, and information overload, are not things individuals can easily change in today's work environment. But the cognitive state itself may be adjustable. This study tests whether a brief, four-step self-regulation protocol (SNAP), meant for application during high-demand in-task moments, can support dealing with cognitive strain.

The target behaviour is noticing cognitive strain during an ongoing work episode and applying a structured self-regulation protocol (SNAP) to restore cognitive clarity. The target population is knowledge workers in cognitively demanding, computer-based roles (analysts, consultants, project managers, finance, insurance, and fintech specialists).

The study proceeded through 4 phases: problem mapping, solution mapping, intervention design, and an empirical EMA feasibility study. The problem map synthesised the literature on cognitive strain, attentional resources, work demands and mapped barriers to in-the-moment self-regulation against the COM-B framework. The solution map reviewed existing approaches (recovery-based, in-the-moment, mindfulness, and pre-performance routines) and identified a gap of no existing intervention combining within-episode timing and sequential coverage of the four self-regulation failure points in a knowledge-work context. SNAP (Spot, Neutralise, Ask, Proceed) protocol was designed as a four-step sequence where each step targets a distinct failure point in the self-regulatory cycle under cognitive strain. Finally, a feasibility study was conducted to explore the feasibility and preliminary effectiveness of using SNAP. The study was a three-day EMA study including 3 prompts per day, with pre- and post-study surveys (N = 14), followed by six semi-structured

interviews. Cognitive clarity, daily intention-behaviour gap, task performance, and well-being were used as the main dependent variables.

Results supported the feasibility of the SNAP protocol. Both completion rate and SNAP use rate exceeded the pre-registered 70% threshold. SNAP use did not predict same-occasion cognitive clarity or intention-behaviour gap, but pre- and post-measures indicated positive directional changes in task-based performance and well-being. The primary mechanism participants described was an increase in self-monitoring capacity to catch automatic avoidance behaviour as it arose and make a deliberate choice, rather than moment-to-moment clarity restoration. Across five of six interview accounts, the experienced benefit was concentrated at the moment of noticing; subsequent steps seemed to have downstream relevance.

Limitations of the study include a small sample size (N=14) and a lack of a control group, due to which causal claims are not possible. The three-day window functioned as an acquisition rather than a consolidation period of using the protocol, and fixed-time prompts could not necessarily capture within-episode effects.

Future research should use episode-triggered sampling include a control condition, extend the practice window to at least two to three weeks to separate the study phases, and add a daily priority-revision item to distinguish deliberate re-prioritisation from non-completion.

The recommendation for practitioners is to treat cognitive strain detection training as the key active ingredient of the intervention. A leaner version of SNAP, built around a personalised signal map, a single trigger cue, and one orienting question, may carry most of the mechanism, while the full four-step protocol remains useful where the goal is to cover a wider range of strain types.

Cognitive strain in knowledge work

Cognitive strain in daily work performance

Knowledge workers requiring sustained information processing and complex decision-making routinely face conditions of high complexity (Kivipõld et al., 2020). Work fragmentation, continuous disruption, and time pressure (Bakker & Demerouti, 2017; Soto et al., 2021) place ongoing demands on their cognitive and attentional resources, including the capacity to direct attention and regulate one's responses during task execution (Bakker & Demerouti, 2017; Beal et al., 2005). When demands exceed available resources, the result is perceived as cognitive strain, in which the capacity for effective self-regulation is impaired (Bakker et al., 2023; Bakker & Demerouti, 2017). Accumulated strain across successive performance episodes has been linked to reduced task performance and diminished psychological well-being (Bakker & Demerouti, 2017; Bakker & Wang, 2020).

In this study, we focus on supporting individuals to acknowledge and avoid defaulting to automatic responses like pushing through discomfort, withdrawing attention, or self-undermining. These responses are often not consciously chosen but rather habitual patterns triggered by familiar situational cues and reinforced by the immediate rewards (Bakker & de Vries, 2021; Bakker & Wang, 2020). Because they operate implicitly and are integrated gradually, these responses are often not recognised until cognitive strain has substantially escalated (Bakker & de Vries, 2021; Bakker & Demerouti, 2017).

Cognitive strain and cognitive clarity

Cognitive strain was defined above as the subjective experience that arises when in-task cognitive demands exceed the attentional resources momentarily available for goal-directed processing (Beal et al., 2005). Rather than treating cognitive strain as an independent

construct, the present study adds an aspect of cognitive clarity and treats them as two phenomenological expressions of a single within-person state. Cognitive clarity refers to the self-perceived sharpness and focus of one's thinking during goal-directed work. Both expressions define the moment-to-moment allocation of attentional resources to the task (Beal et al., 2005). The conditions that amplify strain, like sustained workload, fatigue, negative affect, or inadequate recovery, simultaneously limit the perceived clarity of goal-directed processing (Beal et al., 2005; Wilson & Hutcherson, 2026), and this is what makes them informative companion measures within a single work episode. Wilson and Hutcherson (2026) provide direct within-person evidence of this mechanism, showing across a 12-week intensive longitudinal study that day-to-day upswings in cognitive precision (defined similarly to cognitive clarity) preceded and predicted same-day goal achievement, with an effect equivalent to approximately 40 minutes of additional work (student sample).

What causes cognitive strain?

Previous literature has identified multiple factors that modulate cognitive strain. Task and role stressors, primarily workload and time pressure, are robustly associated with elevated within-person strain and impaired recovery (Sonnentag & Fritz, 2015). In knowledge work specifically, stress, focus, and alertness show meaningful within-person fluctuation that can persist for days (Soto et al., 2021). This is consistent with the within-person variation in cognitive precision identified by Wilson and Hutcherson (2026).

Affective factors, particularly negative affect, divert attentional resources off-task (Beal et al., 2005) and contribute to the gap between intention and action by undermining the cognitive resources needed for goal-directed initiation (Sheeran & Webb, 2016).

Resource-related factors, including accumulated workload and impaired recovery between workdays, can compound so that the baseline from which the next work episode begins is lowered (Sonnentag & Fritz, 2015).

Goal-related factors operate within the episode itself as strain reduces the attentional resources needed to initiate intended actions (Sheeran & Webb, 2016) and to keep attention on-task (Beal et al., 2005), undermining same-day goal pursuit.

A full list of factors related to cognitive strain can be found in **Appendix A**.

The barriers that maintain ineffective strain responses

There are several categories of barriers that maintain the ineffective strain responses. In this study these barriers were mapped against COM-B behaviour change framework components (Michie et al., 2011), and the explanation of why people don't self-regulate in response to strain even if they could was added **(Appendix A)**.

Knowledge workers may lack specific, actionable information on effective regulatory strategies (Fritz et al., 2011). At the same time, the cognitive capacity needed to recognise and respond to strain is most compromised when demands are highest (Bakker & de Vries, 2021). The self-monitoring processes that signal the need for regulation are themselves depleted, making spontaneous regulatory initiation unlikely (Inzlicht & Schmeichel, 2012).

Workload and time pressure have been found to predict lower levels of psychological detachment, and employees paradoxically disengage less from work under the stressful conditions in which recovery is most needed (Sonnentag & Fritz, 2015). Finally, suppression strategies, such as "pushing through", are often habitualised over time and automatically triggered by contextual meaning where deliberate regulatory action becomes unlikely without a specific prompt or trained response (Trenz & Keith, 2024).

Cognitive strain and barriers are interrelated, and their interaction and impact is explained on **Figure 1**.

Figure 1. *Two-stage diagnostic model of cognitive strain response in knowledge work.*

Target behaviour and population

The conditions that generate cognitive strain during knowledge work are often features of the role. This means that individuals routinely attempt to manage them, though not always through strategies that demonstrably support cognitive functioning (Fritz et al., 2011; Soto et al., 2021). Rather than targeting the sources of load, which remain present in many cases and are not always under the individual's control, this study targets perceived cognitive strain by freeing up resources to increase attentional focus. In the Wilson and Hutcherson (2026) study, increased cognitive precision led to increases in self-reported focus, which was found to be one of the strongest predictors of goal achievement. Targeting cognitive strain directly during a high-demand episode, therefore, has the potential to influence the outcomes that matter most in knowledge work. Therefore, the target behaviour for this study is supporting knowledge workers' noticing of the onset of cognitive strain during an ongoing work episode and applying a structured self-regulation protocol before the depletion cycle progresses further.

Solution Mapping

The Problem Chapter identified cognitive strain as a within-person state that fluctuates across work episodes (Beal et al., 2005) and is shaped by factors and maintained by barriers that prevent adaptive self-regulation. Three aspects of intervention are derived from the analysis (**Figure 2**). The intervention must operate within the work episode itself, because strain accumulates across an ongoing episode and the default response is triggered before the episode ends (Bakker & de Vries, 2021; Beal et al., 2005). The intervention must provide sequential coverage across the four barriers identified (restored detection capacity, in-task affect regulation that does not require withdrawal from the work, a deliberate alternative to habitualised suppression, and actionable knowledge of how to apply these in the moment). Addressing only one stage leaves the others to fail (Inzlicht & Schmeichel, 2012; Sheeran & Webb, 2016; Trenz & Keith, 2024). The intervention must support self-initiated activation because the structural conditions of knowledge work might not provide external cues at the moments self-regulation is needed. Workers must be able to initiate the protocol themselves, on the basis of their own state, without organisational scaffolding around each instance. Additionally, to be able to accommodate this, training must be offered to support the understanding of the protocol and its purpose. These aspects together define the design space for an within-episode strain-response protocol in knowledge work.

The existing interventions reviewed below are evaluated against them **(Figure 2)**.

Recovery-based approaches, primarily psychological detachment and micro-break strategies, target resource replenishment between work episodes or after work (Fritz et al., 2011; Sonnentag & Fritz, 2015). Single-technique in-the-moment approaches, including cognitive reappraisal delivered as ecological momentary interventions (Zhu et al., 2025) and daily implementation intention formation (Gollwitzer, 1999; Trenz & Keith, 2024), have demonstrated effects on affect regulation and work performance during the workday. Each

targets a single component of the within-episode regulatory chain, and the EMI approach depends on externally delivered prompts. Mindfulness-based attention training has shown improvements in attentional stability and working memory, though effects are typically cultivated outside demanding task conditions (Mrazek et al., 2013; Price et al., 2023). Of the approaches reviewed, sport psychology pre-performance routines come closest to what we are looking for, as they are multi-step, self-initiated, and sequentially target attentional focus and affect regulation before a performance episode (Cotterill, 2010). They are not, however, developed for knowledge work, where episodes are not discrete, lack clear start signals, and unfold under conditions of continuous interruption rather than discrete preparation (Cotterill, 2010; Soto et al., 2021).

Viewed through the lens of the Behaviour Change Wheel (BCW; Michie et al., 2011; Michie et al., 2014), the reviewed approaches address different components of the strain-response chain and share structural limitations (**Appendix B**). This is the intersection the designed intervention was built to occupy.

Figure 2. *Intervention properties and interventions (based on the articles studied).*

The SNAP protocol

The intervention at hand adapts the multi-step preparatory logic of sport psychology pre-performance routines to the structural conditions of knowledge work, where episodes lack discrete start signals and require self-initiated activation. SNAP (Spot, Neutralise, Ask, Proceed) is a four-step self-regulation protocol created for percieved cognitive strain regulation within performance episode, during knowledge work. Its underlying mechanisms and constructs are explained in **Figure 3**. Each SNAP step targets a distinct failure point in the self-regulatory cycle as it unfolds under cognitive strain, and the steps are sequenced in the order those failures might occur. Together, the four steps form a brief but theoretically coherent scaffold that does not require workers to step away from their tasks or reduce their load.

While the SNAP acronym has been used in other self-regulatory contexts, the present protocol is distinct in its theoretical grounding, target mechanism, and application context. SNAP is designed to operate within the ongoing demands of the workday, supporting the ability to deal with cognitive strain and to continue purposeful action.

Spot the Strain

The aim of the Spot the Strain step is the accurate recognition of one's current mental state, as a regulatory cycle cannot be deliberately initiated without it (Lord et al., 2010). Deliberately spotting the perceived cognitive strain reactivates discrepancy detection and provides the entry condition for the steps that follow. The individual will identify their strain through their thoughts, physical feelings and behaviour.

This step leverages self-monitoring of emotional, cognitive, and physical state (BCT 7.1) supported by prompts and cues (BCT 9.1) from the BCT Taxonomy v1 (Michie et al.,2013).

Neutralise

The aim of the Neutralise step is to interrupt the automatic response to cognitive strain via response modulation (Gross, 2015), before it consolidates into a sustained off-task attentional pull (Beal et al., 2005). A brief regulatory pause targets the cognitive aspects through which unregulated affect diverts attentional resources from the task without resolving the source of strain (Beal et al., 2005).

The corresponding behaviour change technique is "reduce negative emotions" (BCT 11.2 in the BCT Taxonomy v1; Michie et al., 2013), realised here as a brief pause designed to be feasible under cognitive load

Ask

The goal of the Ask step is to explicitly name a single next priority, bringing the task-relevant representation back into accessible memory after strain has biased attention toward whatever is most salient rather than most important (Beal et al., 2005).

Operationally, Ask applies goal setting (BCT 1.1) by Michie et al. (2013), narrowed here to a single proximal priority with a goal of keeping the attention deployed mid-episode.

Proceed

The Proceed step aims to translate the intention from 'ask' into action, specifying the when and how of starting, which reduces the cognitive cost of initiating action under conditions of existing load by intensifying the link between cue and response (Trenz & Keith, 2024).

Proceed applies action planning (BCT 1.4; Michie et al., 2013) through the formation of a brief implementation intention (Gollwitzer, 1999) that converts the stated priority into the smallest possible next action.

Step Name	Concept Addressed	Primary BCT	Mechanism
S - Spot the Strain	**Attentional narrowing** Strain suppresses self-monitoring, causing undetected regulatory breakdown.	**Self-monitoring of state** (BCTTv1: 7.1) **Prompts and cues** (9.1) - internally triggered by scanning body, mind and behavior	Prompts deliberate detection of an internal discrepancy (body, thought, behaviour). Without detection, the regulatory cycle cannot be initiated.
N - Neutralize	**Affect regulation** Unregulated negative affect generates rumination and arousal that divert resources off-task.	**BCT 11.2: Reduce emotions**	Creates a deliberate regulatory pause to interrupt the affective response before it consolidates into task withdrawal.
A - Ask: What's my priority?	**Task-relevant prioritisation** Depleted resources make attention susceptible to capture by whatever is most salient rather than most important in the moment.	**Goal setting behaviour (BCTTv1: 1.1)** Attentional focus / task-relevant cueing	Reinstates the priority (goal) in the self-regulatory feedback loop. Naming a single priority reduces the cognitive cost of reorientation under load.
P - Proceed	**Anchoring of implementation intention** Cognitive strain widens the gap between intentions and completed actions.	**Action planning (BCTTv1: 1.4)** Implementation intentions / actions	Converts the stated priority into a tiniest possible action opportunity delegating initiation from executive control to situational process, reducing the cognitive cost of getting started and offering an opportunity for a reward.

Figure 3. *Target constructs and mechanisms of SNAP.*

Feasibility study of the SNAP protocol

Before the feasibility study a pilot study with 6 participants was conducted to improve the study design and to understand the participant experience.

Research questions and goals

The aim of the study was to understand the feasibility and preliminary effects of the SNAP self-regulation protocol among a small sample of knowledge workers experiencing cognitive strain during the workday. The study plan and initial objectives were pre-registered (https://aspredicted.org/8ih4cn.pdf).

The study addresses two primary questions:

RQ1: Will workers use the SNAP protocol when experiencing cognitive strain at work (including what factors support or hinder its use in everyday work environments)?

RQ2: Does the use of the SNAP protocol increase participants' perceived cognitive clarity and reduce their daily intention-behaviour gap?

Hypothesis

The following exploratory hypotheses were formed:

H1: Participants will report higher perceived cognitive clarity when they used SNAP compared to occasions when they did not.

H2: SNAP protocol use will be associated with a smaller daily intention-behavior gap.

H3: Participants using SNAP protocol report improved task-based performance at the final survey compared to baseline.

H4: Participants using the SNAP protocol will report improved psychological well-being at the final survey compared to baseline.

H5: Perceived cognitive clarity will fluctuate within persons across the three daily measurement points.

H6: Perceived job demands will remain stable from baseline to final survey, confirming that any observed changes in performance or well-being occur within stable demand conditions.

H7: Within-person decreases in cognitive clarity, assessed at midday, will predict larger same-day intention-behaviour gaps in the evening.

Study design

To answer these questions, we conducted a 5 day study. 3-day ecological momentary assessment (EMA) took place on days 2-4. The exact study design and EMA questions can be seen on **Figure 4**. Prior to the EMA phase, the participants were instructed on using the SNAP protocol in a practical online training session. Before and after the EMA phase, participants completed self-report measures assessing task-based performance, psychological well-being, and job demands, on days 1 and 5 (14 survey items; **Appendix C**). During the 3-day EMA phase, participants were sent question-reminder prompts 3 times a day on regular times (morning, midday, and afternoon; **Appendix D**).

The morning prompt served as a daily intention-setting for participants to identify up to three priority tasks for the day, as well as ask how clear and focused their thinking is at the moment of responding. The midday prompt was a check-in and asked participants to report the perceived cognitive demand of the first half of the workday, whether they had used the SNAP protocol, and how clear their focus and priorities were at the time of responding. The afternoon prompt was a reflection of the day, where participants evaluated their completion of the prioritised tasks, reported on cognitive demand and SNAP use during the second half of the day, and assessed their clarity, focus and priorities. The daily measurement occasions thus

served a dual function as a data collection instrument and as a structured practice mechanism intended to support habitual protocol use. After the end of the study, participants were invited to attend a qualitative interview about their participation experience (participation was voluntary).

The total time investment in the study per participant was 2-3 hours (baseline and end surveys a' 10 minutes, training participation 90 minutes, daily prompts up to 10 minutes per day and an optional interview that lasted 30 minutes). The study sample was gathered in 3 post-pilot iterations.

Day 1	Day 2	Day 3	Day 4	Day 5	(as agreed)
	Daily prompts	Daily prompts	Daily prompts		
Baseline Survey Training IWPQ (Koopmans et al., (2014) WHO-5 (Topp et al., 2015) IPD-Work (Fransson et al., 2012) (all short versions)	R1 (morning) How clear and focused does your thinking feel right now? (1–5) List up to 3 key tasks you intend to complete today.	R1 (morning)	R1 (morning)	Final Survey (as in baseline)	Interview (13 questions in a semi-structured interview) Appendix
	R2 (midday) How mentally demanding did the first half of the day feel? (1–5) How clear was your next priority after using SNAP? (1-5) How clear and focused does your thinking feel right now? (1–5) How clear is your next priority now? (1-5) Did you use SNAP?	R2 (midday)	R2 (midday)		
	R3 (afternoon) How mentally demanding did the second half of the day feel? (1–5) How clear was your next priority after using SNAP? (1-5) How clear and focused does your thinking feel right now? (1–5) Did you use SNAP? How clear is your next priority now? (1-5) Did you complete the key tasks you intended to complete today? (0-100%)	R3 (afternoon)	R3 (afternoon)		

Figure 4. *Study design and measurement timeline across the five-day feasibility study.*

Sample

The primary aim of a feasibility study is to assess whether a future definitive RCT can be done, should be proceeded with, and if so how (Eldridge et al., 2016). All substantive findings will be treated as exploratory regardless of their statistical significance. The current sample size is therefore based on feasibility objectives and practical constraints of a master's thesis (Lancaster et al., 2004).

The initial aim was to recruit 20 participants. The final sample consisted of 14 participants, of whom 13 participated in the EMA process, and 10 completed the final survey (70% retention). Out of 10 participants that completed the final survey, 5 were female and 5

were male; age: M = 40.5 years, SD = 6.0, range 32–54 years. 8 of the participants worked with the computer full-time and 2 part-time.

The sample was impacted by the initial recruitment procedure not gaining enough traction, and participants were thus recruited individually through personal contacts.

Measures

Perceived Cognitive Clarity

Momentary perceived cognitive clarity was measured by the single item "How clear and focused does your thinking feel right now?" rated on a 1–5 scale. Administered three times daily via LimeSurvey reminders in the morning (08:00), midday (12:00), and evening (16:00) across the study period. This question was adapted from the subjective phenomenology measure of mental precision used in Wilson and Hutcherson (2026), in which participants rated how sharp and focused (versus scattered) their thinking felt.

Daily measurement of the intention–behaviour gap

To operationalise goal achievement, we quantified the intention-behaviour gap following Wilson & Hutcherson (2026). This is defined as the difference between the 3 main tasks defined at the start of the workday and the reported completion of the tasks at the end of the workday (planned minus completed).

Task-based work performance (IWPQ)

To assess if a short-term protocol use is associated with changes in self-rated task performance, we used the five-item task performance subscale of the Individual Work Performance Questionnaire (IWPQ; Koopmans et al., 2013). Exact questions can be found in the **Appendix C.**

WHO-5

To assess whether short-term protocol use is also associated with changes in subjective psychological well-being we used WHO-5 (Topp et al., 2015) before and after the EMA phase. The WHO-5 includes five positively worded items that are rated on a 6-point scale (0 = at no time; 5 = all of the time) covering the past two weeks (in our study, the past week). Exact questions can be found in **Appendix C.**

Perceived work demands

We measured perceived psychological work demands using the 5-item Psychological Demands subscale of the IPD-Work Consortium questionnaire (Fransson et al., 2012), assessed on a 4-point scale. This subscale is used to describe participants' baseline demand conditions and to verify their stability across the study period (H6). Wilson and Hutcherson (2026) demonstrated, in an intensive longitudinal study of university students, that day-to-day cognitive function fluctuates within individuals and predicts same-day goal achievement independent of mood, motivation, and work hours. Although their work does not address intervention receptivity, the principle that cognitive states vary occasion-by-occasion within persons motivates the question of whether workers in higher-demand roles, who likely experience more frequent strain episodes and higher demands, would have more opportunities to apply SNAP.

Protocol feasibility

We used post-study qualitative interviews to understand how participants experienced the protocol in practice, what they noticed, what they adapted, where it worked and where it did not, and what conditions might support broader implementation of in-task self-regulation methods in the work environment. The interview questions are included in **Appendix E**.

Data Collection

The data was collected using Limesurvey, and the participant communication was done through e-mail. All the data were stored in the University of Tartu, Institute of Psychology servers. Data collection had three phases: 1. Initial registration and informed consent; 2. Pre-EMA study questionnaires, EMA data for 3 days and post-EMA questionnaires; 3. Optional interviews. All data were collected in the English language, as the constructs and measures used originate from the international research literature, and their original versions are in English. The aim of the present study was not to adapt these constructs into Estonian.

Data analysis

Quantitative Analysis

All quantitative analyses were conducted using R. Perceived cognitive clarity was person-mean centred prior to all LMM analyses to isolate occasion-level fluctuation from stable between-person differences. H1, H2, and H7 were tested using LMMs with random intercepts per participant. H5 was tested in two steps: ICC estimation via rptR with 1,000 bootstrap resamples (Stoffel et al., 2017), followed by an LMM predicting clarity from time of day with Bonferroni-corrected pairwise comparisons. H3, H4, and H6 were tested using Wilcoxon signed-rank tests with exact distributions on matched pre-post pairs. Feasibility benchmarks were evaluated using an exact binomial test against the pre-specified 70% threshold. R code and anonymised data are available as supplementary materials.

Given the sample size of the study, all findings were treated as exploratory. Effect sizes and confidence intervals are reported alongside significance tests. Given the sample size, the former carries more inferential weight than the latter (Eldridge et al., 2016).

Qualitative Analysis

6 participants of the study gave their consent to participate in individual interviews. Interviews were conducted over Teams, recorded and transcribed. Transcribed data was anonymised.

Reflexive thematic analysis (Braun & Clarke, 2019, 2021) was used to analyse the information in six steps: familiarisation, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing up. Coding and initial theme generation (Steps 2–3) are presented in condensed form. Theme review, definition, naming (Steps 4–5), and analytic narratives (Step 6) follow.

Since the participants all turned out to be Estonian, the interviews were conducted in Estonian and the analysis was done in Estonian. Then translated to English.

Deviations from pre-registration

We report one deviation from the initial pre-registered analysis plan. The pre-registration targeted a sample of 20 participants, with 25 recruited to account for attrition. The study enrolled 14 participants, 13 with EMA data and 10 matched pre-post pairs, falling short of both targets. No hypotheses were added or removed post-registration. All analyses follow the pre-registered specifications.

Ethical considerations

The study was approved by the Ethics Committee of the University of Tartu (application no: 3/T-16). Participation in the study did not entail any health risks but did require some mental effort and time investment as described above. The study is compliant with GDPR and participants' right to privacy. At the start of the study participants' contact

details were collected in order to set up the study for them and ensure smooth participation. Upon registration, a unique code was generated by each participant, and the key was deleted after completing the data collection.

Results

The results are organised to reflect the study's primary and secondary aims. The feasibility question is addressed first (RQ1), followed by the quantitative hypotheses (H1–H7) and then qualitative findings.

The first research question (RQ1) asked if knowledge workers would use the SNAP protocol when experiencing cognitive strain at work. Of 126 possible EMA occasions across 14 enrolled participants (10 baseline-final survey pairs), 101 were completed, yielding an overall completion rate of 80.2%. This exceeds the pre-specified 70% feasibility benchmark (Palmier-Claus et al., 2011) with a statistically significant difference (exact binomial test: $p = .007$, 95% CI [73.4%, 100%]) giving a confirmatory response to the question. Across the eligible reminder occasions (EMAs 2 and 3), participants reported using SNAP on 75.4% of occasions (49 of 65 occasions). Five participants reported using SNAP on every eligible occasion or all but one, while two participants used it on fewer than half their eligible occasions. Protocol use rates were stable across the three study days (Day 1: 77.3%; Day 2: 72.7%; Day 3: 80.0%).

We did not find a significant effect of SNAP use on cognitive clarity on the same occasion ($\beta = 0.19$, $SE = 0.18$, $p = .304$) so H1 was not supported. Mean clarity was nearly identical on SNAP-used occasions ($M = 3.45$, $SD = 0.79$) and non-SNAP occasions ($M = 3.47$, $SD = 0.99$). We also checked if morning cognitive clarity (REM 1, 08:00) predicted evening task completion (REM 3, 16:00; $N = 30$ observations). There was no significant association with evening task completion ($r = .053$, $p = .783$). Participants with high morning

clarity completed an average of 85.3% (SD = 12.6%) of intended tasks by evening, compared to 86.6% (SD = 13.1%) for those with low morning clarity..

Midday SNAP use was associated with lower evening task completion (β = −12.24, SE = 5.72, t = −2.14, p = .041; n = 29 day-level observations across 11 participants). On evenings following midday SNAP use, mean task completion was 83.5% (SD = 12.7%, n = 24); on evenings without midday SNAP use, mean task completion was 96.7% (SD = 7.5%, n = 5; **Figure 5**), accordingly the H2 was not supported.

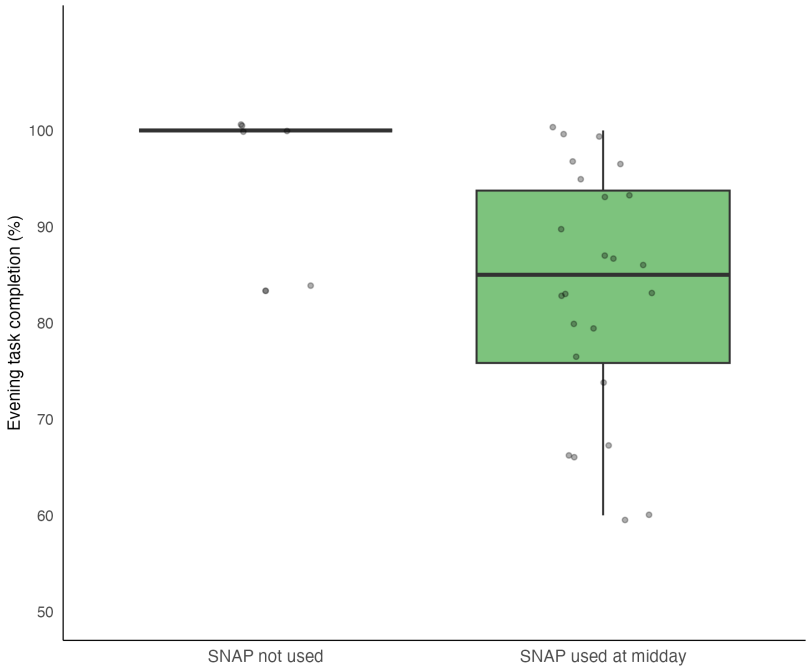

Figure 5: *Midday SNAP use was associated with lower evening task completion.*

Participants reported higher task-based performance at the final survey (M = 4.07, SD = 0.61) than at baseline (M = 3.48, SD = 0.63; Wilcoxon V = 48.5, p = .012, r = 0.92, 95% CI [0.66, 0.98]) which is confirmatory to the initial H3 hypothesis (**Figure 6**, left panel).

Participants also reported higher subjective well-being at the final survey (M = 3.68, SD = 0.48) than at baseline (M = 2.98, SD = 0.63; Wilcoxon V = 46.5, p = .028, r = 0.69, 95% CI [0.15, 0.91]) which supports H4 (**Figure 6**, right panel).

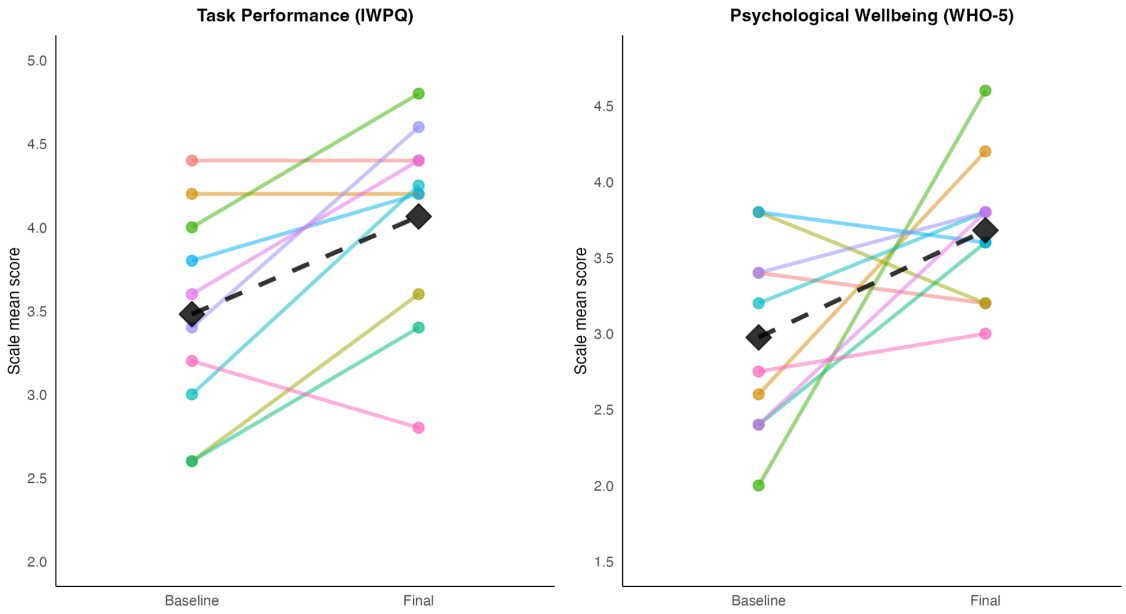

Figure 6: *IWPQ (task performance) and WHO-5 (well-being) in the beginning and at the end of the study. Note. IWPQ: Wilcoxon V = 48.5, p = 0.0117, r = 0.92. WHO-5: V = 46.5, p = 0.0283, r = 0.69.*

Analyses showed that about two thirds of the variation in clarity ratings happened within participants from one occasion to the next, and only about one third reflected stable differences between participants (ICC = 0.33, SE = 0.12, 95% CI [0.08, 0.53], p < .001). In other words, a person who reported high clarity at one moment was not reliably high at others. This confirms H5. **Figure 7** shows the individual trajectories across the nine measurement points (they cross often and take quite different shapes, in line with the ICC).

IPD-work demand scores did not change significantly between baseline (M = 2.84, SD = 0.67) and the final survey (M = 2.78, SD = 0.76; Wilcoxon V = 22.5, p = .75, r = −0.19), which confirms the assumption that work demands did not change during the study period (H6 confirmed).

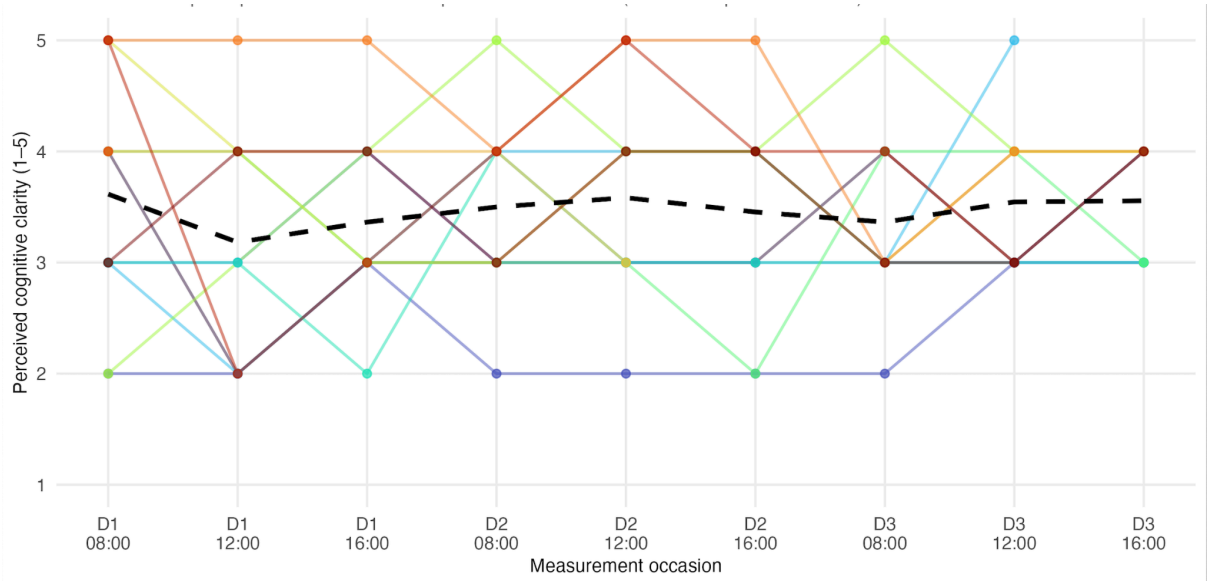

Figure 7: *Individual clarity trajectories across 9 measurement occasions.*

A positive but non-significant association was found between same-day intention behaviour gap and prior cognitive clarity (β = 5.41, SE = 3.45, p = .133), which does not support the H7.

Sensitivity analysis

As pre-registered, the H1 model was re-estimated on a restricted sample comprising participants who completed at least two of three daily reminders on the majority of study days. Twelve of 14 EMA participants met this threshold; two did not. The restricted-sample estimate was identical to the main model (β = 0.19, SE = 0.18, p = .304; n = 64 occasions across 12 participants), confirming that the H1 result is not sensitive to inclusion of the low-completion participant.

Qualitative findings

Six participants who consented to the interview provided accounts of their experience across all three study days. Reflexive thematic analysis (Braun & Clarke, 2019, 2021) was

applied across all six accounts in six phases. The full analytic record can be provided as supplementary material. Five themes were identified and presented here in the order of most relevant to the research questions.

Catching the automatic response (Theme 1)

The most consistently described benefit, across five of six accounts, was the event of noticing that strain-related reaction had started. One participant described detection as "already more than half the victory". Once the avoidance behaviour was named and recognised, the automatic sequence was interrupted. The remaining protocol steps built on this interruption rather than producing it. Several participants described detection alone as sufficient to redirect their attention. The "Neutralise" and “Ask” steps were downstream consequences of a prior moment of noticing, not the cause of it.

One participant extended this finding: "Detection did not always lead back to the task. Sometimes it led to a conscious decision to take the avoidance activity anyway but with awareness rather than automatically.” Another participant valued this explicitly: "at least I recognise that I've now gone into overload."

The individual approach helps with integration (Theme 2)

No participant used SNAP exactly as designed across the four steps in their prescribed sequence, yet every participant described the protocol as feeling natural rather than artificial. One skipped the breathing step on the grounds that detection alone was sufficient for them. Another participant applied it specifically to initiating cognitively aversive tasks rather than for mid-task regulation. The third participant reduced the protocol to the breathing component and applied it to emotional frustration rather than cognitive strain during performance.

Training has a purpose (Theme 3)

When asked directly about the impact of the SNAP training session prior to the EMA study, all six participants described it positively and identified it as important for their subsequent protocol use. Training was recalled as meaningful and as having generated something beyond procedural knowledge. One participant described the training precisely: "During the seminar, the belief arrived that this might work. And it did."

Workplace demands are an issue (Theme 4)

SNAP requires a degree of attentional autonomy that workplace conditions might remove. An unexpected colleague's arrival mid-task broke the attentional thread before any detection could occur, after which the task required a completely fresh start. One participant's first study day (the day back from an extended trip) produced too many simultaneous demands for using the SNAP in their opinion, but the subsequent two days were more effective. A third participant, on the contrary, mentioned that unusually calm week meant that the demand-driven avoidance pressure that SNAP was designed for was largely absent.

All six participants described three days as an acquisition window rather than a consolidation period. One used a concrete analogy: January gym resolutions normalise by February because habit formation requires consistent repetition over weeks. Another estimated several weeks to a month would be needed to build a reliable personal strain vocabulary.

SNAP has a restoring impact (Theme 5)

Where participants described the subjective experience of SNAP working, they consistently used restoration language. Things like returning to an earlier, clearer, more purposeful state. One participant named this the "morning freshness" (the clear, intentional state present at the start of the day that degrades under fatigue) and described SNAP as

cutting through the accumulating fog: "a small refresh, like restarting a computer, and you're back." Another described returning to "that moment when you were completely present and knew what needed to be done today". A third described this through productivity by simply staying with tasks longer and completing more.

What factors support or hinder SNAP use in work environments?

Figure 8 summarises the supporting and hindering factors for SNAP use that were identified through reflexive thematic analysis of the six post-study interviews. Four factors emerged as supporting use: the training seminar functioning as a credibility event, personalised signal mapping during training, participants' freedom to adapt the protocol to their own working style, and the availability of task autonomy and uninterrupted work periods in which the protocol could be applied. Four factors hindered use: external interruptions that removed attentional autonomy before detection could occur, role structures incompatible with daily goal-setting, low-demand study weeks in which the trigger for protocol use was largely absent, and a three-day study window that participants consistently described as too short for habit consolidation. The supporting and hindering factors derived from interviews are not mirror images of one another, and they operate differently. The supporting factors seem to concern individual aspects, while the hindering factors seem to concern structural and ecological conditions outside the worker's control.

SUPPORTING FACTORS		HINDERING FACTORS
Training seminar as credibility event	**SNAP** protocol use in everyday work	External interruptions
Personalised strain signal mapping		Day-level context variability (calm weeks lack activation signal; overload days exceed metacognitive bandwidth)
Self-determined, adapted use		Three days: too short for habit consolidation
Acquisition of metacognitive observational stance		

Figure 8: *Supporting and hindering factors of SNAP use based on thematic analysis.*

Discussion

The aim of the present work was to support knowledge workers' deliberate self-regulation in response to cognitive strain. Because many of the conditions that generate strain are largely features related to the work role rather than individually changeable, the focus was on equipping workers to recognise strain as it arises and respond accordingly. We first constructed a problem map describing the mechanisms underlying cognitive strain and used COM-B to characterise barriers that maintain ineffective automatic responses to strain (Michie et al., 2014). We then looked into the existing intervention landscape and designed the SNAP protocol to occupy the gap identified. A brief, self-initiated, four-step sequence for within-performance episode use was designed, covering cognitive strain detection, affect regulation, priority setting, and action initiation. Following, a feasibility study examined if knowledge workers would use the protocol in the moments it was designed for, if its use would produce detectable effects on perceived cognitive clarity and daily goal completion, and how participants would experience the protocol in practice.

Figure 9 summarises the main quantitative findings. The feasibility benchmarks were met, and the qualitative results gave a coherent picture of how participants used the protocol, so the basic feasibility question can be answered in the affirmative. The EMA ratings showed no effect of SNAP use on cognitive clarity, while the interviews described a clear sense that something was working. Rather than reading this as a contradiction, we take it to mean that the two methods were measuring different things, giving insight about what a future RCT should look like. The pre-post improvements in task-based performance and well-being moved in the expected direction, while the effect sizes are large. With the small sample and no control condition, the results are just signals worth following up on rather than evidence of efficacy. The findings address the psychological capability barrier from the COM-B mapping more directly than the other components. Workers were missing a trained, actionable strategy

for in-task regulation, and SNAP appears to have supplied one, though, as the following sections explain, in a narrower form than the four-step design initially assumed.

	WHAT WAS TESTED:	OUTCOME
RQ1	Do workers use the SNAP protocol when experiencing cognitive strain at work?	Confirmed
H1	Higher perceived cognitive clarity on SNAP-used occasions vs. non-SNAP occasions	Not supported
H2	SNAP use associated with a smaller daily intention–behaviour gap	Not supported
H3	Improved task-based performance (IWPQ) at final survey vs. baseline	Supported
H4	Improved psychological well-being (WHO-5) at final survey vs. baseline	Supported
H5	Within-person fluctuation in perceived cognitive clarity across daily measurement points	Supported
H6	Perceived job demands stable from baseline to final survey	Supported
H7	Within-person decreases in midday cognitive clarity predict larger same-day intention–behaviour gaps	Not supported

Figure 9: *The main findings of the feasibility study.*

Which cognitive outcomes SNAP targets?

Concerning the main research question, EMA data did not support the hypothesis that SNAP use was associated with increased cognitive clarity or that using SNAP was inversely associated with task completion. The qualitative accounts, in contrast, were largely positive. Leaving aside the fact that the study was statistically underpowered, one possible explanation for this is that in the interviews, participants did not describe SNAP as raising their clarity rating at the next fixed-time reminder, but they described a change in how they related to their own cognitive experience. Reporting it as a capacity to notice avoidance before or while the automatic sequence was running, so they were able to choose what came next. Participants described this effect through expressions such as “catching oneself mid-avoidance”, “pausing”, and “returning to the intended task”, which unfolded over seconds to minutes within an episode. This indicates that the main effect of using SNAP might have been on participants' self-regulatory capacity, which the clarity item was not

designed to measure. SNAP's contribution in this sample was less the installation of a four-step regulatory procedure and more the cultivation of a metacognitive observational stance that made previously automatic avoidance visible and therefore subject to deliberate intervention or choice.

The second result was that using SNAP on average led to lower evening task completion. This finding can be explained with two insights from the qualitative interviews. During the interviews, participants reported using SNAP more frequently on days when their perceived cognitive demand was higher. Nevertheless, there remains a question of whether they meant cognitive strain or generally higher stress days, which refer to different constructs. Additionally, midday protocol use may have prompted participants to re-evaluate their priorities, whereby they deliberately shifted away from their initial tasks toward what felt more pressing. If correct, this suggests the task-completion metric may have penalised the behaviour SNAP was designed to support (deliberate reprioritisation in response to changing demand), and a future study should distinguish non-completion from informed reprioritisation through a daily priority-revision item.

SNAP increased well-being and task performance

Participants reported improvements in task-based performance (IWPQ) and well-being (WHO-5), both in the hypothesised direction. Under the current sample size, these results reflect preliminary signals but come with caveats. The IWPQ was developed with a four-week recall window, and its sensitivity to a shorter period has not been formally established. The present study compressed the recall window to one week to match the intervention period. The WHO-5 recall window, modified here to one week, overlaps directly with the intervention period, so the final score is partially a measure of the intervention week rather than an independent post-test, which in a way reflects the use of the SNAP tool but

under the conditions of the intervention. A post-study measure and/or a control would help understand these effects in future studies by helping us understand if this signal would consolidate or fade over a longer measurement window.

SNAP feasibility and refinement

The qualitative findings raise a question about the protocol's design. If most participants concentrated their use at the Spot step and treated other steps downstream as non-essential, would a leaner version preserve the active ingredient? There are a couple of ways this can be viewed.

For most participants in this sample, detection alone seemed sufficient to interrupt the automatic sequence. This pattern is consistent with control-process accounts of self-regulation in which discrepancy detection is the gating step that initiates the regulatory cycle. Considering this, a protocol that reliably installs detection has installed the active mechanism even if subsequent steps are skipped. However, the same dataset shows the other steps doing real work for other strain types too. For example, P5 used the full sequence, including breathing, specifically for fatigue-induced cognitive fog, and detection alone could not restore access to clear intention, and the physiological pause appeared necessary. Additionally, we know from past research that strain identification is not the only regulatory challenge knowledge workers struggle with. This suggests the choice between the leaner and the original version is a choice between two different intervention goals. A leaner version might serve the detection efficiently but would underserve the fatigue and affect-regulation pathways that matter for participants like P5. The full four-step version, on the other hand, is more universal, covering a wider range of strain-related issues and providing properties that matter if the goal is a deployable workplace tool for different scenarios. The trade-off is real, and the design choice depends on context and goal.

Bringing SNAP closer to knowledge workers

The qualitative findings indicate that SNAP's effect operates at the seconds-to-minutes scale of within-episode avoidance detection, while a self-initiated protocol requires the metacognitive bandwidth that depletion suppresses. A different delivery model could shift detection from the user to the work environment itself.

In many organisations Slack, Teams, and other similar collaboration platforms already mediate most information flows in cognitively demanding knowledge work. An integration into these systems could deliver an intervention triggered by behavioural signals of strain (rapid app switching, prolonged idle periods, and late-day declines in keyboard activity), or an intervention could be initiated by the user themselves. The user would still supply the regulatory response (Spot, and where needed Neutralise, Ask, Proceed), but the environment would supply the detection cue or other conditions supporting the knowledge worker when their own monitoring system is impaired. Additionally, training periods and operational periods could be timed in these tools, allowing for more flexibility when experimenting. This could be a way to resolve the measure-mechanism gap that was detected.

Limitations & Future Directions

The interpretation of this study is constrained by several limitations. The final sample of 14 participants with EMA data and 10 matched pre-post pairs fell short of the recruitment target and produced wide confidence intervals. The absence of a control condition further means that observed pre-post changes cannot be separated from regression to the mean, demand characteristics, or natural weekly variation. A subsequent study should include within-person effects and at minimum an active or waitlist control arm.

Participants described three days as too short to develop a reliable personal signal detection habit or to fully consolidate the four-step sequence, with several estimating that weeks of deliberate practice would be required. The H7 test was also structurally underpowered compared to the 84-day design from which the underlying clarity–intention association was derived (Wilson & Hutcherson, 2026). Future studies should extend the observation window to two to three weeks, ideally separating the study phases. But, while this addresses one constraint, it may miss the more important one. Framing the duration question only as "how long until habit forms" may miss the importance of a strong conceptual shift or cue-response identification. A future study should therefore not simply extend the duration of EMA but invest in the training phase with even more embodied practice across SNAP steps and add a consolidation training session after a short time of initial practice. After that, a test of whether a shorter or longer practice window (two to three weeks) is sufficient, should follow. This design would allow the separation of the contribution of training from practice duration, which the current study cannot do. It’s clear that three days was not enough to detect consolidation effects, but the more interesting question for a follow-up is what minimum duration becomes sufficient when the design is optimised.

Perceived cognitive clarity was measured at three fixed times per day, while the qualitative interviews suggested that SNAP's primary effect is at the within-episode timescale

(the seconds-to-minutes window in which avoidance is detected and interrupted). The H1 measurement instrument was therefore structurally not a good match to the mechanism. A future study should replace or supplement fixed-time prompts with episode-triggered sampling, task transitions, or end-of-episode ratings to bring the measurement timescale into alignment with the regulatory timescale.

Participants whose SNAP use was low did not consent to the interview, and the dataset therefore offers no first-person account of their experience. This is a self-selection limitation that biases the qualitative findings toward the experience of engaged users and leaves the conditions under which SNAP fails to take hold systematically under-represented. A future study should build a low-use interview pathway into the design from the start (for example, in the final survey). This way disengagement narratives would be captured at the point of the study rather than be dependent on a separate consent decision that low-use participants are least likely to make. This approach will allow more consistent insight into developing self-regulation tools for the workplace setting and for knowledge workers.

A further confound is the thrice-daily EMA prompts asking participants to specify priorities, evaluate cognitive demand, and rate clarity. They overlap substantially with the self-monitoring activity SNAP is designed to install. Observed pre-post improvements, therefore, cannot be cleanly attributed to SNAP itself versus to the structured self-reflection the EMA imposed. A future RCT should include a measurement-only control arm to estimate the contribution of the EMA independent of the protocol.

Conclusion

In conclusion, the present work addressed a specific gap in the strain-regulation literature. The absence of a brief, self-initiated protocol that knowledge workers could apply within an ongoing performance episode. SNAP proved feasible in this context, and the

qualitative evidence located its operative mechanism at the detection step, the moment at which automatic avoidance is interrupted and converted into deliberate choice.

Before redesigning the four-step protocol itself, the next steps are to improve how the protocol is introduced, where it is delivered, and how its effects are measured. Stronger training to install the observational skills, in-environment delivery that reaches the within-episode moments, and episode-specific measurement are the changes most likely to clarify whether SNAP works.

Statement on the use of Generative Artificial Intelligence

While preparing for this thesis, Claude.ai and Grammarly were used in a limited capacity as a supporting tool for language editing, critique, alternative framings, structural clarity and RStudio coding. All the conceptual work, theoretical arguments, study design, data analysis and interpretation of the results were made by the author, and the cited sources have been verified and worked through.

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Appendices

Appendix A: Barrier mapping against target behaviour.

Target behaviour: knowledge workers' notice of the onset of cognitive strain during an ongoing work episode and apply a structured self-regulation protocol before the depletion cycle progresses further				
COM-B Component	**Related factor (Problem Map)**	**Specific barrier to target behaviour**	**Why it persists**	**References**
Psychological capability (knowledge & skill)	Subjective focus; intention–behaviour gap	Workers lack specific actionable knowledge of in-task regulatory strategies that can be applied without stepping away from the task.	Without trained alternatives, workers default to familiar but ineffective responses (task-switching, pushing through, browsing) that provide momentary relief without restoring cognitive functioning.	Fritz et al. (2011)
Psychological capability (cognitive capacity)	Resource depletion; subjective focus	The monitoring system that detects discrepancies between current and desired states is itself weakened under depletion, precisely the conditions under which the target behaviour is most needed. Depletion dulls the error-monitoring system, shifting attention away from goal-discrepancy cues and toward reward cues. The worker becomes less likely to notice that regulation is required at the moment it is most needed.	This creates a self-defeating paradox, where capability is most impaired when demand for it is highest.	Inzlicht & Schmeichel (2012)
Physical opportunity	Workload / time pressure; accumulated workload	High demands and fragmented task environments make in-task pause feel structurally unaffordable because the cost (lost time) is immediate while the benefit (restored clarity) is delayed.	When demands are high, the perceived cost of pausing exceeds the perceived benefit of regulating, especially when the benefit (restored clarity) is delayed and the cost (lost time) is immediate.	Bakker & Demerouti (2017); Soto et al. (2021)
Social opportunity	Negative affect / mood state; accumulated workload	Under persistently high demands, negative emotions narrow thought–action repertoires, and workers shift toward avoidance coping rather than proactive regulation.	The loss cycle is self-reinforcing. Workers who most need to regulate are least supported by their environment to do so, and their own depleted regulatory behaviour generates further demands.	Bakker & De Vries (2021); Bakker & Wang (2020)
Reflective motivation	Intention–behaviour gap; subjective focus	Avoidance behaviours carry legitimate-looking rationales and feel productive, so the reflective calculus favours task continuation, which is the "productive disguise of avoidance". (switching tasks, checking email)	Avoidance disguises itself as productivity, making deliberate self-regulation feel unnecessary or excessive.	Beal et al. (2005); Sheeran & Webb (2016)
Automatic motivation	Resource depletion; intention–behaviour gap	Push-through and avoidance responses become habitual over time, triggered automatically by cognitive strain cues and reinforced by the immediate reward of task continuation.	Habitual avoidance is faster and less cognitively demanding than deliberate regulation. Under depletion, automatic responses dominate.	Bakker & De Vries (2021); Trenz & Keith (2024); Inzlicht & Schmeichel (2012)

Appendix B: Existing interventions.

Existing Approaches to Cognitive Strain and Cognitive Clarity in Knowledge Work						
Approach	**What it does**	**Problem factors addressed**	**Target mechanism**	**Timing / context**	**Evidence of effect**	**Feasibility constraints**
Recovery-based interventions (outside task execution)						
Psychological detachment training (Sonnentag & Fritz, 2015)	Teaches employees to mentally disengage from work during non-work hours.	Workload, time pressure, accumulated (chronic) workload, resource depletion	**Detachment**; prevention of strain accumulation	After-hours or off-shift.	Consistently associated with lower strain accumulation and higher next-day regulatory capacity.	Depends on employee autonomy and genuine time to disengage. Might be absent in high-demand, always-connected roles.
Micro-breaks (general) (Fritz et al., 2011; Trougakos et al., 2008)	Brief pauses during the workday.	Resource depletion across the day, negative affect, mood state, focus	**Recovery** from resource depletion and cognitive overload	During workday, between tasks.	Most commonly used micro-break strategies are unrelated to vitality, but several are associated with higher fatigue. Only meditation positively predicted vitality.	Break quality depends on regulatory demands of the activity, not break occurrence per se.
Expressive writing (Michailidis & Cropley, 2019)	Structured written disclosure of stressful work experiences to process and reduce rumination.	Negative affect, mood state, resource depletion across the day	Reduction of work-related **rumination**; improved psychological **detachment**.	Typically outside task execution; requires dedicated time and privacy.	Demonstrated reductions in rumination, improvements in detachment, and sleep quality.	Time and effort required make it poorly suited for delivery during or between tasks in most workplace settings.
In-the-moment single-technique interventions						
Cognitive reappraisal (momentary / EMI) (Zhu et al., 2025; Aitken et al., 2025)	Brief prompts delivered via mobile to reinterpret a work situation or emotional response as more positive or meaningful.	Negative affect , mood state, depression symptoms, subjective focus	**Affect regulation**; reduction of negative affect and its downstream performance costs.	During workday, delivered via mobile phone prompts.	Reduced negative affect and increased positive affect; improved same-day performance and reduced counterproductive behaviour. Situation reappraisal more effective than emotion reappraisal.	Requires receptivity to prompts and willingness to engage with brief written activity mid-task. Less effective during cognitively complex task episodes without structured support.
Implementation intentions (daily formation) (Trenz & Keith, 2024; Gollwitzer, 1999)	If-then planning that links a specific situational cue to a specific intended action.	Intention–behaviour gap, subjective focus	Supports **action initiation**; conserves resources for task execution.	Typically formed at the start of the day or before a task episode; applied within task execution.	Predicted frequency and growing automaticity of targeted workplace behaviour.	Is not addressing the preceding affective or attentional state that may prevent clear priority-setting.
Mindfulness-based attention training (MBAT) (Mrazek et al., 2013; Price et al., 2023)	Structured mindfulness practice, targeting attentional regulation and working memory.	Resource depletion, subjective focus, negative affect, mood state	Reduced **mind-wandering**; improved **attentional stability**.	Training delivered outside demanding task conditions; applied benefits expected to transfer to work episodes.	Improved working memory and reduced mind-wandering in controlled settings; protective attentional effects in applied organisational settings.	Trained and practised outside demanding task conditions. Transfer to in-task moments of acute cognitive strain is not directly demonstrated.
Multi-step / sequenced self-regulation protocols						
Sport psychology pre-performance routines (Cotterill, 2010)	Combines attentional focus, relaxation, imagery, and self-talk to achieve optimal performance states before a discrete performance episode.	Subjective focus, negative affect, mood state, resource depletion (arousal)	**State regulation** prior to performance; **attentional focus** and **affect regulation**.	Applied before a discrete, time-bounded performance episode (e.g., a throw, race, competitive bout).	Extensively studied in sport contexts with demonstrated effects on performance.	Not tested in work environments where work episodes might not be as discrete where no clear start signal cues a preparatory routine.

Appendix C: Self-report measures assessing task-based performance, well-being, and job demands.

Participants completed a questionnaire assessing demographic information, task performance, well-being, and psychological job demands.

Demographic Information

1. Please specify your age: _____
2. Please indicate the way you work:
    a. I work on a computer full time
    b. I work on a computer part-time.
    c. I do not use a computer for my work
3. Please indicate your gender: _____

Task-Specific Performance

Participants rated the following items using a 5-point Likert scale
(1 = seldom, 5 = always).
Over the past week:
I managed to plan my work so that I finished it on time.
I kept in mind the work results that I needed to achieve.
I was able to set priorities.
I was able to carry out my work efficiently.
I managed my time well.

Well-Being

Participants indicated how often they experienced the following during the past week, using a 6-point scale (0 = at no time, 5 = all of the time).

Over the past week:
I have felt cheerful and in good spirits.
I have felt calm and relaxed.
I have felt active and vigorous.
I woke up feeling fresh and rested.
My daily life has been filled with things that interest me.

Psychological Demands at Work

Participants rated the following items using a 4-point scale (1 = strongly disagree, 4 = strongly agree).

My job requires working very fast.
My job requires working very hard (intensively).
I am not asked to do an excessive amount of work. (reverse scored)
I have enough time to get the job done. (reverse scored)
My job requires me to respond to conflicting demands simultaneously.

Appendix D: EMA prompts sent during the three practice days.

Morning, sent at 08.00 “Before diving in, set your intention.”

How clear and focused does your thinking feel right now? (1–5)
List up to 3 key tasks you intend to complete today.

Day, sent at 12.00 “Quick check-in - how are you doing?”

How mentally demanding did the first half of the day feel? (1–5)
How clear was your next priority after using SNAP? (1-5)
How clear and focused does your thinking feel right now? (1–5)
How clear is your next priority now? (1-5)
Did you use SNAP?

Afternoon, sent at 16.00 “A quick reflection”

How mentally demanding did the second half of the day feel? (1–5)
How clear was your next priority after using SNAP? (1-5)
How clear and focused does your thinking feel right now? (1–5)
Did you use SNAP?
How clear is your next priority now? (1-5)
Did you complete the key tasks you intended to complete today? (0-100)

Appendix E: Qualitative interview questions.

Interview Questions

Research Question: Do workers use the SNAP protocol when experiencing cognitive strain at work, and what factors support or hinder its use in everyday work environments?

Introduction

Purpose, format, and expected duration of the interview
How data will be used and stored
Informed consent confirmation

General Questions
How would you describe your overall experience of taking part in this study - both the daily check-ins and using the protocol itself?

SNAP Questions

- Can you walk me through a specific moment when you used SNAP during your workday? What was happening, and what did you do? (What made that a moment when you reached for the protocol rather than pushing through?)
- Were there moments when SNAP felt unnatural or awkward to use? What made those moments difficult?
- During the N — Neutralise and A — Ask steps specifically, did you notice any shift in how clearly you could focus on what you needed to do next, or did things feel much the same?
    - How did the other steps of the protocol work for you?
- Was SNAP helpful? How?

Workday Fit Questions

- How did the three daily reminders feel in practice (in terms of timing and the attention they required)? (Were any of them particularly well-timed, or did any feel intrusive or redundant?)
- Did participating in this study change anything about the way you approached your tasks (how you planned, paced, or prioritised your work)?
- Did you notice any change in your sense of stress or mental strain across the three days?

Barriers and Enablers

- What would have made it easier to use SNAP consistently? What got in the way?
- What was the impact of the training to your motivation and interest to participate in the study? (Did it fade?)
- How did the amount of daily reminders feel? What if you would need to go through this process for more than 3 days?
- Any advise for bringing skills like dealing with cognitive strain to the work environment?

Final Question
Is there anything important about your experience that I have not asked about?

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