The Role of Executive Functions for the Link Between Unfinished Tasks and Work-Related Rumination

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Abstract

Unfinished tasks at work are a common experience and previous occupational health research has linked it to work-related affective rumination, dwelling on negative thoughts and emotions about work during non-work time. Our study aimed to replicate the findings of previous research, additionally investigating whether executive functions moderate the relationship between unfinished tasks and affective rumination. We collected cross-sectional data from 98 working adults, using convenience sampling. An online survey was conducted, using validated scales to measure unfinished tasks, affective rumination and executive functioning. Consistent with our expectations, results show that unfinished tasks are positively linked to affective rumination. Additionally, our results show that executive functioning positively moderate affective rumination, in the face of unfinished tasks. This confirms the moderation effect we proposed. However, the direction of the effect is contrary to our expectation, which was that executive functions would buffer the negative effects of unfinished tasks on affective rumination. Participants with higher levels of executive functions were more affected by the level of unfinished tasks compared to participants with lower levels. Practical implications are that organizations may benefit from being realistic when assigning tasks to employees and implementing well-being interventions tailored by executive functions profile.

Keywords: unfinished tasks, affective rumination, executive functions, control theory

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In work life, having unfinished tasks is a commonly experienced situation by many employees (Syrek & Antoni, 2014). Unfinished tasks at work can be defined as tasks that an employee had planned on completing, but are left incomplete for example because the employee stopped working and there was not enough time (Syrek et al., 2016). Unfinished tasks have been identified as a serious work stressor, and a key onset for work-related rumination (Syrek et al., 2017). Many previous studies have linked unfinished tasks with work-related rumination, thinking about work during non-work time (Syrek et al., 2017; Weigelt et al., 2019). The evidence on unfinished tasks and rumination is highly significant for organizations, because experiencing rumination from work stressors may inhibit recovery and impair well-being after work (Syrek et al., 2018). A meta-analytic study has shown evidence for a positive correlation between negative work-related thoughts and health complaints and burnout (Jimenez et al., 2022). Considering how detrimental work stress is, it is important to gain understanding on the issue of workers thinking about work tasks during off-job time.

Work-related rumination has been defined as "the process of perseverative thinking or dwelling about problems and issues relating to work" (Cropley et al., 2016). Although research has brought attention to the lack of detachment from work for the health of workers, a specific facet of rumination has been identified to have significant health impairing effects. Affective rumination, unlike other facets of rumination, is characterized by negative affective thoughts about work (Cropley et al., 2016)). This occurrence of negative work-related thoughts during off-job time has been linked to an impairment in recovery from stress during leisure time (Wendsche et al., 2021; Jimenez et al., 2022). Thus, affective rumination has been linked to many physical

and psychological health detriments; including sleep impairments (Syrek et al., 2017), emotional exhaustion (Firoozabadi et al., 2018) higher fatigue and lower levels of vigor (Minnen et al., 2021). Many studies have already linked unfinished tasks and affective rumination (Syrek et al., 2017; Weigelt et al., 2019).

Although the relationship between unfinished tasks and affective rumination is well established, there is limited research on the possible moderators for their relationship. Inter-individual differences might moderate the level of affective rumination experienced by employees. One difference that may be of role is executive function (Koster et al., 2011). Executive functions are a set of cognitive mechanisms that individuals use to control impulsive emotions, thoughts and behavior, and make decisions that align with their goal. Considering that unfinished tasks may lead to affective rumination through the accessibility of content and negative valence of the experience, the cognitive ability to control these impulsive thoughts about the tasks and the negative emotions is expected to affect the strength of the relationship. With the following study, we aim to investigate the potential moderating role executive functioning has on the effect of unfinished tasks on affective rumination.

Unfinished Tasks and Affective Rumination

Unfinished tasks have been identified as a work stressor that correlates with rumination, specifically affective rumination (Syrek et al., 2017). In their conceptualization of work-related rumination, Cropley and Zijlstra (2011) have identified three main facets: affective rumination, problem-solving pondering, and psychological detachment. Affective rumination is defined as "the appearance of intrusive, pervasive, recurrent thoughts, about work, which are negative in affective terms" (Cropley & Zijlstra, 2011). This paper will specifically focus on affective rumination as it is characterized by thinking in negative affective terms, therefore, it is in line

with the aim of our study to expand knowledge on the detrimental effects of unfinished tasks. There is consistent evidence for a positive link between unfinished tasks and affective rumination (Syrek et al., 2017; Weigelt et al., 2019; Weigelt et al., 2023). Several theories have been used to explain this well-established relationship, but the most prominent ones are Lewin's field theory (1939), and control theory (Carver & Scheier, 1982).

Field theory (Lewin, 1939) explains how unfinished tasks may lead to affective rumination by predicting the elevated accessibility of unfinished tasks. Lewin's Field Theory explains that tension rises from unfinished tasks, and this tension makes relevant content more cognitively accessible during the process of completing the task. This is normally useful, as this tension may serve as a motivation for completion of the task. However, for tasks that aren't finished before non-work time, this cognitive accessibility of task related content causes thinking about work tasks when they are irrelevant, leading to affective rumination. Zeigarnik's experiments (1927, 1938) provides evidence for the enhanced accessibility, demonstrating that unfinished tasks are remembered better than finished tasks due to the strong desire to complete the task, with a 90% higher likelihood to be remembered than finished tasks.

Control theory (Carver & Scheier, 1982) explains the relationship between unfinished tasks and affective rumination through the discrepancy between wanting to complete a task and not having completed it. The theory proposes that wanting to achieve goals but not yet having achieved them results in the individual experiencing discomfort and distress, due to wanting to reduce this discrepancy. Based on Control theory, unfinished tasks likely lead to discomfort due to their unresolved nature and unattained goals. This discomfort may be expressed in affective rumination. Martin and Tesser (1996) have shown that recurrent thoughts may rise regarding

goal related information, specifically when the rate of progress doesn't match the expectation of the employee, thus underlying affective rumination.

Our study investigates affective rumination as a dependent variable, in line with the Control theory. The aspects of evoking discomfort and tension are central to affective rumination, both part of affective rumination items. With our study, we aim to build on and strengthen the previous findings that have shown that having unfinished tasks is associated with higher affective rumination (Syrek et al., 2017; Weigelt et al., 2018).

Hypothesis 1. Unfinished tasks at work are positively related to affective rumination during off-job time, so that a higher number of unfinished tasks at work is associated with higher affective rumination.

Executive Functioning as a Possible Moderator

The contingencies underlying the effects of unfinished tasks on affective rumination are underexplored. Studies suggest that there may be substitutes for the impairing effects of unfinished tasks, such as engaging in proactive work behavior. (Weigelt et al., 2019). Prior research has emphasized behavior and contextual factors. However, it is also important to investigate individual differences as a possible buffer for effects of unfinished tasks, as dispositions have so far attracted limited attention. One such factor is executive functioning (EF). Control theory predicts unfinished tasks to lead to negative cognitions, therefore the ability to control cognition to disengage from negative cognitions may be crucial to determine one's tendency to affective rumination in the face of unfinished tasks (Koster et al., 2011)

Executive functions are a set of cognitive mechanisms that support goal-directed behavior. EF is especially important for situations requiring concentration, when automatic responses are unfavorable thus needing to be inhibited (Burgess & Simons 2005, Espy 2004,

Miller & Cohen 2001). There are three core constructs commonly considered in conceptualizations of EF: Inhibition, Working memory (WM), and Shifting (Lehto et al. 2003, Miyake et al. 2000, Diamond, 2013). Inhibition is one's ability to control their attention, emotions, thoughts and behavior from simply doing what is automatic, intrusive, cued by external stimuli in order to do what is beneficial for them. An example is one's ability to stop themself from having off-job thoughts while working because it would not be useful to disengage from the content of tasks. WM is used for one's ability to hold and manipulate information in their mind. WM is important also for Inhibition, as one must be able to hold their goal in mind to know what is necessary to inhibit. Shifting, also referred to as cognitive flexibility, refers to one's flexibility to adjust to changed circumstances, in terms of changed demands or priorities. Shifting highly overlaps with creativity, task switching and set shifting (Diamond, 2013). Karr et al (2018) has found these three facets to align the strongest with abilities most commonly represented in EF factor models, compared to other possible facets such as planning (Karr et al., 2018, Karr, 2024). Therefore this paper will explore the interplay of these specific constructs altogether for a moderating role.

Impairment of EF is an impairment of one's information processing ability, as previously explained by the EF conceptualization by Diamond (2013). Information processing impairments have been theorized to contribute to strengthening ruminative tendencies (De Raedt & Koster, 2010; Koster et al., 2011, Whitmer and Banich, 2007). The EF facets collectively determine one's ability to cognitively control, thus "override pre-potent responses and to inhibit the processing of irrelevant or previous relevant information" (De Lissnyder, 2011). Affective rumination may arise from thoughts about previously relevant information, in this case unfinished tasks, so a person's cognitive ability to control these impulsive automatic thoughts is

expected to affect how strongly unfinished tasks lead to affective rumination. This suggests that a person lower on EF may be bothered more strongly by higher levels of unfinished tasks.

The three facets of EF are predicted to individually contribute to alleviating the effect of unfinished tasks on affective rumination. Inhibition ability may weaken rumination through control of thoughts about no longer relevant information, especially in the relation to unfinished tasks. As predicted by Field theory, due to the incomplete nature, unfinished tasks are expected to elevate accessibility of thoughts about unfinished tasks. However, stronger inhibition is expected to weaken this effect as the individual has a stronger ability to control these intrusive thoughts about unfinished tasks. Inhibition of distracting and no longer relevant information, proponent response inhibition and task switching inhibition have all been found to be relevant for experiencing rumination (De Lissnyder et al., 2011; Colzato et al., 2018; Owens & Derakshan, 2013; Zetsche et al., 2012). Moreover, Control theory may explain why stronger Shifting could elevate the effect of unfinished tasks. The theory predicts unfinished tasks to lead to rumination due to the discrepancy between wanting to complete a task and not having completed it. A person high on Shifting is expected to be able to switch goals, consequently be able to switch their goal from task completion to recovery once work-time ends. Therefore, Shifting would be relevant for weakening the effect of unfinished tasks on rumination experienced. WM memory is also important for this moderation effect. The goal of non-work time is recovery from work demands. A person with stronger ability to keep this currently relevant goal in mind during leisure time is expected to be less bothered by the incomplete previous goal.

There is limited research on EF as a moderator for unfinished tasks. In this study, we will examine the construct in a new work-related setting. Based on the theorization, we expect that a person lower on EF may be bothered more strongly by higher levels of unfinished tasks.

Hypothesis 2. An employee's executive functioning moderates the link between unfinished tasks and affective rumination. The link is weakest when executive functions are stronger.

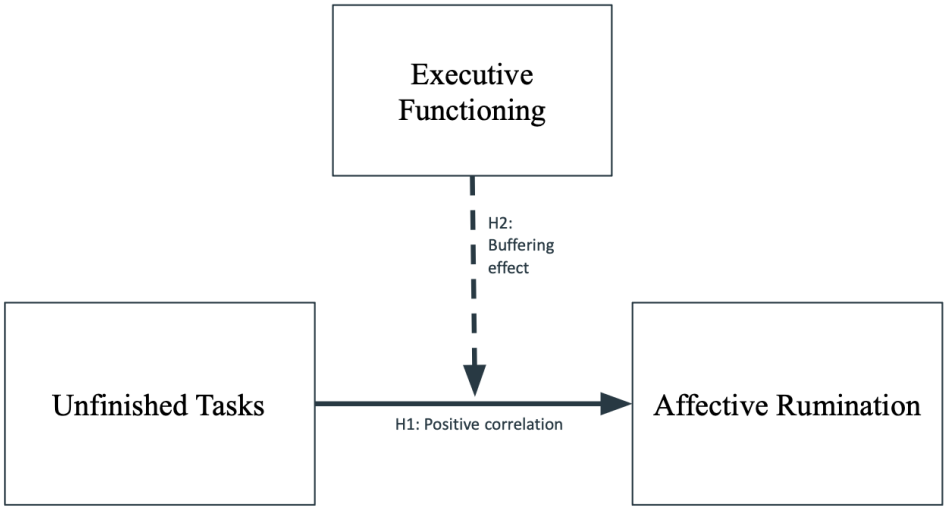

Figure 1. *Visual representation of the research model.*

Methods

Procedure

We conducted a cross-sectional survey design for our study. This study was part of a larger data collection effort by a group of ten bachelor students. Therefore the survey measured multiple variables, see Appendix B for the complete survey. This paper specifically focuses on the following variables: unfinished tasks as a predictor, affective rumination as a criterion variable, and EF as a possible moderator. The study was exempt from formal examination by the Ethics Committee of the Faculty of Behavioral and Social Sciences at the University of Groningen.

We recruited participants using a convenience sampling method, approaching participants through social networking platforms such as WhatsApp and Instagram. The recruiting message

included the link to the survey. The requirement to be a participant was to be employed either part-time or full-time. Before taking the survey, the first page of the link presented a research information page that explains details of the study. The second page presented the informed consent form, in which participants had to select to give consent for the use of their data in order to take the survey. The participants could stop taking the survey at any point if they wanted.

The survey was taken individually and the time it took to complete was approximately 12 minutes. The survey was designed using Qualtrics and scales used in the survey were all validated. Participants had the option to take the survey in their preferred language: English, Dutch or German. No rewards were provided for participation and no deception or debriefing procedures were used. At the end of the survey, we provided the contact information of two members of the research team to give participants an opportunity to request a summary of findings at the end of the study.

Sample

Participants had to be employed full time or part time and to be above 18 years old. In total, 135 people responded to the survey, 37 were excluded due to not answering all items or always answering with extreme scores, for example only rating 1 or 5 on the scale. The final sample consisted of 98 participants. Most participants were between the ages of 26 and 57 years old, with a mean age being 42 years. The sample consisted of 49% (n=48) female, 51% (n=50) male, so the proportion of male and female were balanced. The sample was of the following nationalities: Dutch, Indian, Cypriot, French, Kenyan, British, American, Romanian, German, Turkish, Egyptian, Norwegian, Austrian, Singaporean and Canadian. The majority of participants were Dutch. The majority of participants held a Bachelor's degree as their highest level of completed formal education. The occupations of the participants included finance

director, teacher, IT professional, architect, engineer, manager, consultant. The average number of professional working years was 22 years of professional working experience. The average working time was around 31-40 hours per week.

Measures

Unfinished Tasks

Unfinished tasks were measured using the scale by Syrek and colleagues (2017). The items on the scale measure the amount of unfinished tasks at the end of the workweek. Items are rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Participants were asked to refer to a typical work week when answering the items. A sample item is "At the end of the workweek, I have not finished important tasks that I had planned to do."

Affective Rumination

Affective rumination was measured using the scale by Cropley and colleagues (2012). Items are rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item includes "I become tense when I think about work-related issues during my free time."

Executive Functions

EF was measured using an adapted version of the Short Executive Function scale by Karr (2024). The original scale is a 15-item questionnaire measuring five EFs: Planning, Inhibition, Working Memory, Shifting, and Emotional Control. In the adapted version the scale was reduced to 9 items. This scale adaptation was done in order to fit the length constraint of the survey. Only items measuring Inhibition, WM and Shifting were used in the survey as this paper focuses on these specific facets of EF. Items are rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). A sample item for the Inhibition facet includes "I am an impulsive person." A

sample item for the Shifting facet includes “I am good at multitasking.” A sample item for the Working Memory facet includes “I am good at working through problems in my head.”

Analytic Strategy

All analyses were conducted using the JASP (2024) software. In order to test our hypotheses, we ran multiple linear regression analyses with interaction effects. Prior to the main analysis, preliminary analysis was conducted to test for reliability of the scales used in the survey. To ensure the scales are reliable, Cronbach’s alpha coefficient was calculated to ensure that the scores are above 0.7. Next descriptive statistics including means, standard deviations and correlations were plotted to summarize the data. We then checked whether the assumptions for regression analyses were met. More specifically, residual plots were created and analyzed to see whether linearity and homoscedasticity assumptions were met. The VIF score was calculated to test for multicollinearity. Additionally, a Q-Q plot was used to test for the normality assumption. In the main analysis, we looked at the t-value of the unstandardized coefficient (B) for UT and ran a multiple regression analysis to see the strength and direction of the main effect. EF and UT were mean-centered prior to creating the interaction term. A moderation analysis was done by inspecting the t-value and finding the interaction effects by adding EF to the regression model to see the strength of the moderation effect. The analyses were done by forming an interaction term by multiplying UT by EF. Simple slopes were inspected to inspect the moderation effect in different levels of EF.

Results

Preliminary Analysis

We tested the internal consistency of the scales by calculating the Cronbach’s alpha (α) coefficient for scales capturing unfinished tasks (UT), affective rumination (AR) and executive

functions (EF). We found that the reliability scores measuring UT and AR are good as they scored above 0.8 (α = .83 for UT, α = .88 for AR; see Table 1, Appendix A). Scores for items 1, 4 and 7 in the EF scale were reversed. Moreover, for the EF scale, we removed the fourth item "I am an impulsive person"and the fifth item "I am good at solving math problems through my head" due to low item-rest correlation (r = 0.02 for fourth item, r = 0.16 for fifth item). When the two items were dropped, Cronbach's alpha increased from α = .64 to α = .69, indicating that the reliability of the scale capturing EF is moderate.

Due to the reliability score, we also split up EF into facets for the preliminary analysis to see the reliabilities and correlations of each EF facet. The Cronbach's alpha scores for Inhibition and Shifting were both moderate (α = .64 for Inhibition, α = .64 for Shifting; see Table 1), and it was low for Working Memory (α = .44 for Working Memory; see Table 1). We decided to continue to investigate the moderation effect of EF overall rather than splitting EF up into facets, as the reliability is better for use. Moreover, in EF research it is common practice to study EF as an overall score based on items on the facets, instead of measuring facets separately (Aydoner & Bumin, 2025; Ogneva et al., 2025; Werchan et al., 2025).

Based on the correlation analysis, we can conclude that there is a moderate positive relation between the predictor UT and the criterion variable AR (r = .33, p =.001, see Table 2). Therefore, we conclude that having more UT is associated with higher levels of AR. This is in line with our first hypothesis. The correlation between UT and EF was non-significant (r = -.135, p =.186, see Table 2). We also found a significant negative correlation between the moderator EF and AR (r = .22, p =.029). Additionally, among the EF facets, there is a high positive correlation between Shifting and Working Memory (r = .463, p <.001, see Table 2). We also found a positive relation between Inhibition and Shifting (r = .256, p = .011, see Table 2). The

correlation between Inhibition and Working Memory was non-significant (r = -.134, p =.189, see Table 2).

Furthermore, we checked whether the assumptions for linear regression analysis have been met, specifically analyzing linearity, homoscedasticity, normality, and multicollinearity. Linearity and homoscedasticity assumptions are met based on the residual plots (see Figure 3), as residuals are scattered randomly around zero. Additionally, Q-Q plot (see Figure 2) was used to test for the normality assumption. No points deviated significantly, so the normality assumption is met. Finally, the variance inflation factor (see Table 3) was used as a test for multicollinearity. All values were under 4 (Table 3), therefore, we concluded that the multicollinearity assumption has been met.

Main Analysis

Our main analysis tested our two hypotheses, the link between UT and AR (H1) and whether EF buffers the effect of UT on AF (H2). Regarding our first hypothesis, the linear regression showed that there is a significant result for a positive relation between UT and AR (B = .42, t = 3.282, p = .001, see Table 3 and Figure 4). At the average level of EF (centered EF = 0), a one standard deviation increase in UT was associated with a 0.42 increase in AR (B = .42, SE = .13, see Table 3). This is in line with our first hypothesis, showing that participants with higher numbers of UT experienced higher levels of AR.

Regarding our second hypothesis, we also found a significant result (t = 2.39, p = .02, see Table 3). Every one standard deviation increase in the interaction effect of UT and EF was associated with a 0.57 increase in AR (B = .57, SE = .24, see Table 3). This indicates a relatively weak significant moderation effect of EF in the link between UT and AR. Simple slopes revealed that the effect of UT on AR was non-significant at low levels of EF (B = .103 , p = .571, see

Figure 5). This suggests that at low levels of EF, UT were not associated with a decrease in AR. At high levels of EF, the effect of UT on AR was strongly significantly positive ($B = 0.735$, $p = .000$, see Figure 5). This suggests that at higher levels, EF strengthens rather than weakening the relationship between UT and AR. This is contrary to our expectations for the moderation effect.

Additionally, the simple slopes (see Figure 5) suggest that AR was generally higher for low EF, compared to high EF. AR stayed higher for low EF whether there was low or high UT, therefore, there seems to be a ceiling effect for low EF. This is in line with our expectations, as we expected higher AR levels for individuals with lower EF. Overall, the regression model explained 18.7% of the variance in our data, suggesting that 18.7% of the variance in AR can be explained by the model including UT, EF and interaction of UT and EF ($R2 = .187$, see Table 4).

Discussion

The aim of our study was to replicate the well-established link between UT and AR, but additionally investigate the possible moderation role EF plays in this interaction. Our results are in line with Hypothesis 1, suggesting that the larger the amount of UT is, the more AR you are likely to experience. Additionally, in support of Hypothesis 2, we found that EF may play a moderating role in this relation. Contrary to our hypothesis, we found that having higher EF may amplify rather than buffer the effects of higher UT on AR. Interestingly, low EF levels overall resulted in higher AR regardless of UT levels.

Theoretical Implications

Our findings build on and reinforce previous research, as they imply a positive correlation between UT and AR. The results align with Lewin's field theory, supporting the theory that tension from UT increases accessibility of related thoughts, thus leading to AR.

Additionally, our results for Hypothesis 1 are in line with Control Theory (Carver & Scheier, 1982) and Zeigarnik's experiments (1927, 1938). On the contrary, our results for Hypothesis 2 are not in line with Control theory, as we suggested that EF may decrease the effect of AR on UT by helping reduce goal-discrepancy-induced stress.

Previously we explained the possible link between UT and AR by the discrepancy between wanting to complete the task and not having completed it resulting in distress, thus leading to thoughts about the task. Our findings support this by showing that a larger number of UTs lead to larger levels of AR in participants. Our study also proposed that EF may be a moderator for this link between UT and AR. In light of Control Theory we suggested that a stronger ability to regulate goal-related thoughts, emotions and behavior may help reduce the occurrence of negative thoughts and emotions due to UT. Our results don’t support this, as participants with stronger EF experienced more AR, in an interaction with UT. Drawn from Control theory, a possible explanation is that individuals with high EF may be more capable of tracking unresolved goals. Therefore, having higher EF may make individuals more sensitive to goal non-fulfillment. It is possible that in this context, higher EF levels enable sustained goal representation when experiencing higher UT, leading to prolonged thinking of UT after work.

Additionally, participants with weaker EF experienced higher overall levels of AR, whether they had lower or higher UT. This may suggest that there may be a ceiling effect for experiencing AR for individuals with low EF. This may suggest that individuals with EF deficits may struggle with coping with the effects of UT, no matter the UT level. A possible explanation can be made using the dual-process models of self-regulation (Hofmann et al., 2012). It suggests that people are either governed by two systems: system 1 which is impulsive and automatic, or system two which is reflective and controlled. As system 2 heavily relies on EF, individuals with

lower EF would be weaker in system 2 control. Based on this, individuals with lower EF may have more trouble ruminating, as they may have more difficulty overriding impulsive responses from system 1 when encountering situational cues. This means that when situational cues result in UT related thoughts, they may get "stuck" ruminating. AR levels may be higher for lower EF regardless of UT level as the issue results from cognitive control limitations, rather than task load.

Our study confirms what previous studies have shown that the number of UTs are strongly linked to the level of AR employees experience (Syrek et al., 2017). However, our study also extends knowledge in AR literature by investigating why certain employees may ruminate more than others when being subject to UT. Our study introduces EF as a factor that can explain this inter-individual difference. We introduce new knowledge in this field, as the significant moderation effect we found suggests that EF may amplify the negative effects of UT. EF is highly understudied in an organizational context as most AR research studies the effect of contextual factors. Our study emphasizes the importance of studying EF as a moderator in a new, work-related setting contrary to the common clinical setting in topics such as ADHD and depression.

Practical Implications

Considering that experiencing rumination from UT may inhibit recovery and impair well-being after work, it is important to consider the practical implications our findings may suggest for employees and managers. Based on our finding, when subject to UT, employees may think about work tasks during off-job time, which has been found to be harmful for recovery and well-being (Wendsche et al., 2021; Jimenez et al., 2022). This finding has highly relevant practical implications for organizations. An action managers can take is to ensure that the number of tasks

assigned to employees for the day are realistic, in order to reduce the number of incomplete tasks at the end of the work day. Additionally, time management training may be implemented by the organization to promote task closure and task prioritization.

Secondly, our study shows the importance of tailoring well-being interventions based on EF profile. For example, for individuals with weaker EF, our study shows the importance of supporting these employees regardless of task load, as they may consistently have higher AR levels unrelated to UT levels. Organizations can implement EF training to help employees develop strategies to compensate and supplement for the deficits in employees' Shifting, WM and Inhibition. For example, organizations can assign EF coaches to measure baseline EF and based on weaknesses or strengths, train and suggest strategies to improve ability to plan, prioritize, focus and follow through to be able to cope with UT. This kind of training is also commonly implemented and effective in clinical settings for ADHD, as ADHD is strongly linked to deficits in EF (Shuai et al., 2017). This can also be done through leadership practices, such that leaders foster environments that respect off-job boundaries and encourage recovery-supportive activities.

Strengths and Limitations

A primary strength of the study is the use of validated scales for all three constructs measured: UT, AR, EF. The scale for UT (Syrek et al., 2017) and AR (Cropley et al., 2012) both have good reliability scores based on Cronbach's alpha scores, thus the scales have strong internal consistencies. In order to give the study precision, EF was broken down into facets to test the reliabilities and correlations of what defines the umbrella term. We specifically studied the three EF facets Karr et al. (2018) found to align the strongest with abilities most commonly represented in EF factor models. This was done to fit the length constraints for the survey, in

order to minimize participant fatigue. However, adapting the scale by Karr (2024) by only including the items measuring the three specific facets might have affected the internal consistency of the scale. Shortening a validated scale can negatively impact the reliability and construct validity (Heggestad et al., 2019), reflected in the shortened EF scale with the moderate Cronbach's alpha score we found. Additionally, the reliability scores for items of the three facets separately were not above moderate. Due to this, including facets in the moderation analysis was not reliable. The correlations among the facets weren't significant for all, although it was for the majority. The correlations for all facets not being significant is a limitation of the EF scale, suggesting that what certain items measure may significantly differ from each other.

Another strength of our study was the inclusive design. The survey was translated to three different languages: English, Dutch and German to increase accessibility and reach of our survey. The utilization of translation also helps minimize participant mistakes due to language comprehension, giving participants the choice to complete the survey in the language they are most confident with. Moreover, the demographics of the participants is diverse in age, nationality, and occupation. This enhances the generalizability of the results to a wider population. However a limitation with the participants was the sample size. Our sample size is acceptable and it was sufficient to detect a significant interaction effect. Despite this, our sample size is still relatively small (N= 98), therefore our results should be interpreted with caution. It is possible that findings vary with larger or more diverse samples.

Additionally, the use of a cross-sectional design restricts the ability to draw causal conclusions regarding the relationship between the variables. A drawback is that it is not possible to determine the direction of the effects. However, the use of a cross-sectional design is particularly suitable for the examination of interactions. Cross-sectional designs offer sufficient

statistical power and stability in estimating moderation (Siemsen, Roth, & Oliveira, 2010; Spector, 2019). Therefore, the design of our study is suitable for investigating our research question, which centers on the moderating role of EF on the link between UT and AR.

Future Research

Based on the strengths and limitations identified, we can derive avenues for future research. One possibility would be to utilize a longitudinal design to study the relationship between UT, AR and EF. A drawback of our study was the use of a cross-sectional design due to time constraints, however, future research could investigate the same relationship through a diary study. This would allow the researchers to study the interplay of the variables through a longer period and better establish causality. Moreover, this would allow researchers to track how the effects vary throughout the day and week. Another benefit of employing a diary study would be that researchers can learn what other factors may come into play when facing UT.

Although our study has identified a moderating role of EF for UT, more studies are necessary to establish this effect. Derived from our limitation, future research should use more reliable EF measures and can also measure other possible facets of EF to investigate the interaction effect. According to Salthouse (2005) “there is not yet much agreement about the nature of this construct and even less about how it is best assessed”. EF measures seem to differentiate in what facets and aspects of EF they measure. More research is clearly necessary to determine confidently what the facets of EF are. Our research wasn’t able to focus strongly on aspects of EF facets. Additional studies examining the individual contribution of EF facets in the moderation would be beneficial to expanding EF literature, as certain facets may be more relevant for the amplification effect. Additionally, researchers could employ EF training to

investigate whether compensating and supplementing for deficits in EF through training is effective for minimizing AR.

Conclusions

To summarize our key findings, this study supports the positive relationship previous research has found between UT and AR, with the addition of an amplifying effect of higher EF levels. Our study shows that UT is linked with AR. However, employees with stronger EF may be more affected by the effects of UT. Regardless of UT levels, individuals with lower EF may consistently ruminate more compared to those with higher levels of EF. EF offers a promising pathway to understand what individual factors may influence employees to disengage from work stressors and improve well-being, especially under larger work-demands. Finally, our research highlights the importance for employees and organizations to minimize the number of UTs at the end of the work day in order to create healthier and more sustainable work environments.

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Appendix A

Figure 2.

Q-Q plot of standardized residuals

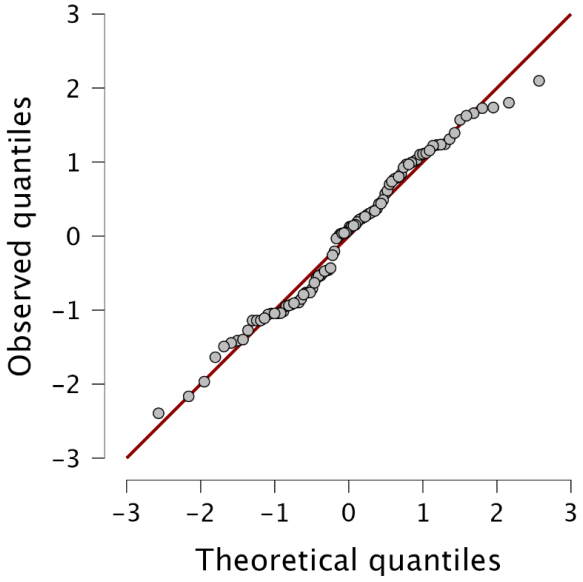

Figure 3.

Residuals vs predicted plot

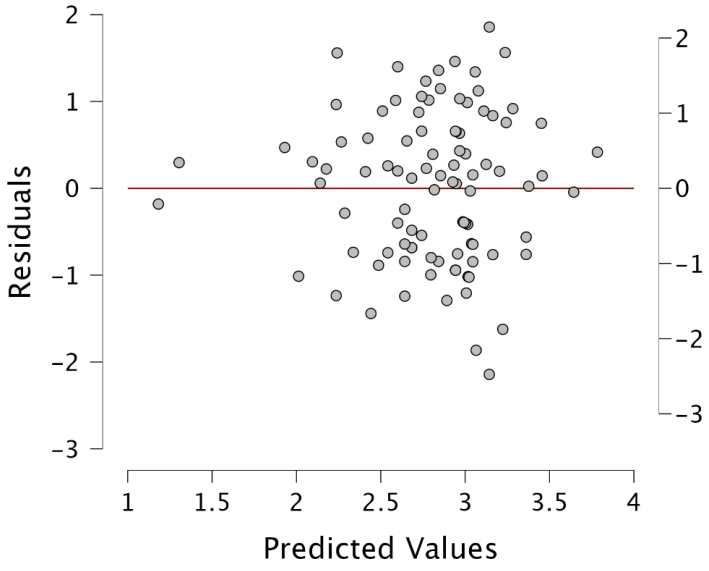

Figure 4.

Scatterplot for the correlation between unfinished tasks and affective rumination

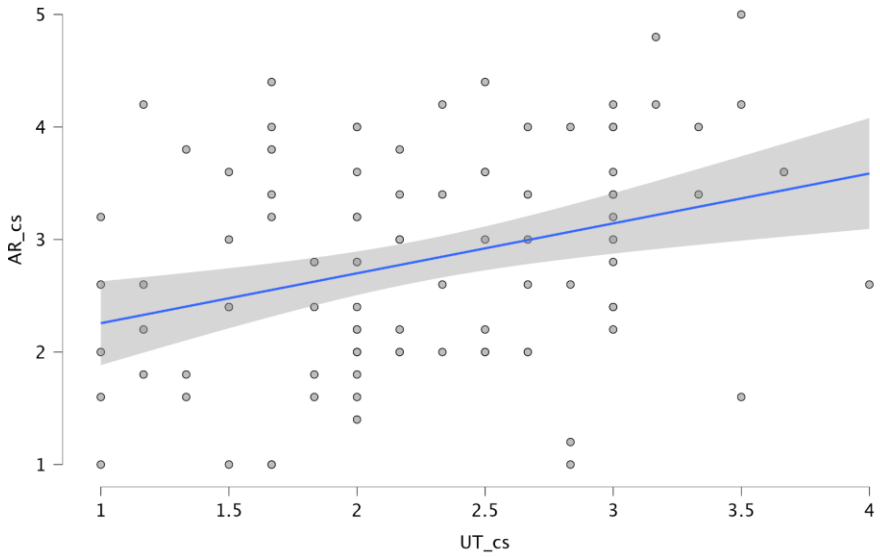

Figure 5.

Simple slopes for the interaction effect

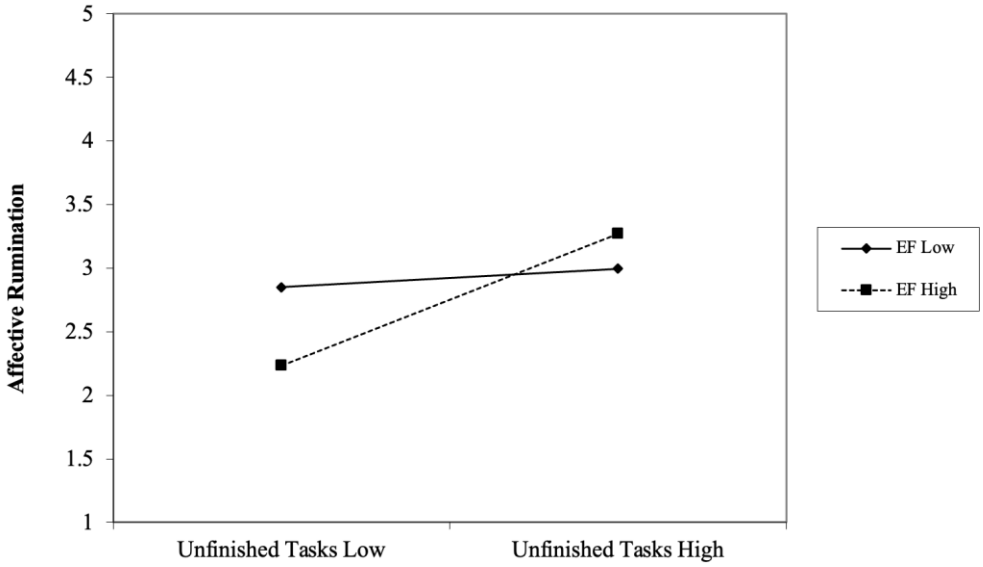

Table 1.

Composite reliabilities of scales

Construct	Number of Items	Cronbach's alpha
Unfinished Tasks	6	0.83
Affective Rumination	5	0.88
Executive Functions	7[1]	0.69
Inhibition	3	0.64
Shifting	3	0.64
Working Memory	3	0.44

Note. [1]The EF scale was adapted from the Short Executive Function Scale (Karr, 2024). Two items were removed due to low item-total correlation, resulting in a 7-item version.

Table 2.

Descriptive statistics: Means (M), Standard Deviations (SD), Pearson Correlations (r)

Variable	M	*SD*	1.	2.	3.	4.	5.	6.
1. Unfinished Tasks	2.25	0.71	–					
2. Affective Rumination	2.81	0.96	.33**	–				
3. Executive Functions	3.69	0.56	–.14	–.22*	–			
4. Inhibition	3.7	0.74	-.-80	-.092	.523***	–		
5. Shifting	3.52	0.78	-.291***	-.121	.879***	.256*	–	
6. Working Memory	3.54	0.67	-.064	-.012	.551***	-.134	.463***	–

Note. All ratings were on 5-point scales ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

N = 98.

*< .05, **< .01, ***< .001

Table 3.

Main and Moderation Regression Analysis

Variable	ß	*SE*	*t*	*p*	Collinearity Statistics	
					Tolerance	VIF
Unfinished Tasks	0.42	0.13	3.28	.001	0.98	1.02
Executive Functions	-0.15	0.18	-0.87	0.39	0.84	1.19
Unfinished Tasks * Executive Functions	0.57	0.24	2.39	0.02	0.86	1.17

Note. N = 98.

Table 4.

Model summary

Model	R	R square	Adjusted R square	Root mean square error	Change Statistics			
					R square change	df1	df2	p
1	.33	.11	.1	.91	.11	1	96	.001
2	.37	.14	.12	.9	.03	1	95	.065

2	.43	.19	.16	.88	.05	1	94	.019

Note. Model 1 Predictors: (Constant), unfinished tasks

Model 2 Predictors: (Constant), unfinished tasks, executive functions

Model 3 Predictors: (Constant), unfinished tasks, executive functions, interaction

Appendix B

Survey Instrument

Introduction

This survey explored how employees deal with unfinished tasks and manage to switch off during off-job time. The aim of this research is to identify which strategies work best and detect ways to improve employee well-being. The survey consisted of four parts: demographic information, work-related experiences, general beliefs and behaviors, and work-life balance / sleep / recovery.

Part 1: Demographic Information

Participants were asked to provide basic demographic information and general information about their work.

- What is your gender? (Woman / Man / Non-binary / Prefer not to say)
- What is your age? (open-ended)
- What is your nationality? (open-ended)
- What is your highest level of formal education you have completed? (Primary school / High school / Vocational training / Bachelor's degree / Master's degree / Ph.D.)
- What is your occupation or job title? (open-ended)
- How many professional working years do you have? (open-ended)
- How many hours do you work per week on average? (0-10 hours / 11-20 hours / 21-30 hours / 31-40 hours / More than 40 hours)

Part 2: Work-Related Experiences

<u>Performance Expectations</u>

(Responses were rated on a 5-point Likert scale: 1= Strongly Disagree, 5=Strongly Agree)

- My team leader expects me to perform at my highest level.
- My team leader encourages me to go above and beyond what is normally expected of one (e.g., extra effort).
- My team leader expects me to give 100% all of the time.

Unfinished Tasks

(Responses were rated on a 5-point Likert scale)

- At the end of the workweek, I have not finished important tasks that I had planned to do.
- At the end of the workweek, I have not finished a large amount of due tasks.
- At the end of the workweek, I have not completed urgent tasks.
- At the end of the workweek, I have not even started with important tasks, I wanted to complete
- At the end of the workweek, I need to carry many tasks into the next week.
- At the end of the workweek, I have not started working on urgent tasks that were due.

Taking Charge

(Responses were rated on a 5-point Likert scale)

- I try to bring about improved procedures for the work unit or department.
- I try to institute new work methods that are more effective for the company.
- I try to change how the job is executed to be more effective.

- I try to introduce new structures, technologies, or approaches to improve efficiency.
- I try to implement solutions to pressing organizational problems.
- I try to make constructive suggestions for improving how things operate within the organization.
- I try to correct faulty procedures or practices.
- I try to make innovative suggestions to improve what the organization does.
- I try to change organizational rules or policies that are nonproductive or counterproductive.
- I try to adopt improved procedures for doing my job.

Professional Self-efficacy

(Responses were rated on a 5-point Likert scale)

- I can remain calm when facing difficulties in my job because I can rely on my abilities.
- When I am confronted with a problem in my job, I can usually find several solutions.
- Whatever comes my way in my job, I can usually handle it.
- My past experiences in my job have prepared me well for my occupational future.
- I meet the goals that I set for myself in my job.
- I feel prepared for most of the demands in my job.

Work Competence Need Satisfaction

(Responses were rated on a 5-point Likert scale)

- I really master my tasks at my job.
- I feel competent at my job.
- I have the feeling that I can even accomplish the most difficult tasks at work.
- I am good at the things I do in my job.
- I doubt whether I am able to execute my job properly.
- I don't really feel competent in my job.

Part 3: General Beliefs and Behaviors

Stress Mindset

(Responses were rated on a 5-point Likert scale)

- The effects of stress are negative and should be avoided.
- Experiencing stress facilitates my learning and growth.
- Experiencing stress depletes my health and vitality.
- Experiencing stress enhances my performance and productivity.
- Experiencing stress inhibits my learning and growth.
- Experiencing stress improves my health and vitality.
- Experiencing stress debilitates my performance and productivity.
- The effects of stress are positive and should be utilized.

Regulatory Focus

(Responses were rated on a 5-point Likert scale)

- To achieve something, one must be cautious.
- To avoid failure, one has to be careful.
- Being cautious is the best policy for success.
- You have to take risks if you want to avoid failing.

- The worst thing you can do when trying to achieve a goal is to worry about making mistakes.
- Taking risks is essential for success.

Executive Functioning

(Responses were rated on a 5-point Likert scale)

- I do risky things without considering the consequences.
- I can hold multiple things in my mind at once.
- I am good at multitasking.
- I am an impulsive person.
- I am good at solving math problems in my head.
- I am good at getting back on task after a distraction.
- I do things without thinking them through.
- I am good at working through problems in my head.
- I can shift my focus between different things.

Cognitive Flexibility

(Responses were rated on a 5-point Likert scale)

- I consider multiple options before making a decision.
- When in difficult situations, I consider multiple options before deciding how to behave.
- When I encounter difficult situations, I stop and try to think of several ways to resolve it.
- I often look at a situation from different viewpoints.
- I like to look at difficult situations from many different angles.

- I seek additional information not immediately available before attributing causes to behavior.
- When I encounter difficult situations, I feel like I am losing control.
- When encountering difficult situations, I become so stressed that I can not think of a way to resolve the situation.
- When I encounter difficult situations, I just don't know what to do.
- I feel I have no power to change things in difficult situations.

Part 4: Work-Life Balance, Sleep, and Recovery

Affective Rumination

(Responses were rated on a 5-point Likert scale)

- I become tense when I think about work-related issues during my free time.
- I get annoyed by thinking about work-related issues when not at work.
- I become irritated by work issues when not at work.
- I become fatigued by thinking about work-related issues during my free time.
- I am troubled by work-related issues when not at work.

Problem-Solving Pondering

(Responses were rated on a 5-point Likert scale)

- After work, I tend to think of how I can improve my work-related performance.
- In my free time, I find myself re-evaluating something I have done at work.
- I think about tasks that need to be done at work the next day.
- I find thinking about work during my free time helps me to be creative.
- I find solutions to work-related problems in my free time.

Positive Affective Work Prospection

(Responses were rated on a 5-point Likert scale)

- I am enthusiastic about the work I still have to do.
- I am looking forward to the workdays ahead of me.
- I feel good when I think about upcoming work events.
- I have positive expectations about the workdays ahead of me.

Detachment

(Responses were rated on a 5-point Likert scale)

- I forget about work.
- I don't think about work at all.
- I distance myself from work.
- I get a break from the demands of work.

Sleep

(Responses were rated on a 5-point Likert scale)

- I have trouble falling asleep after turning off the lights.
- Once asleep, I have difficulty staying asleep.
- My final awakening is earlier than desired.
- My total sleep duration is sufficient.
- My overall quality of sleep is satisfactory.

Recovery Activities

(Responses were rated on a 5-point Likert scale)

During off-job time, to what extent do you engage in activities that…

- Require you to be physically active.

- Include vigorous physical activity.
- Include social interaction.
- Involve spending time with others.
- Allow you to be creative.
- Are creative.
- Require you to be mentally active.
- Require you to concentrate.
- Involve spirituality.
- Involve meditation, prayer, or taking time in other ways to find inner peace.
- Occur through digital devices (such as smartphone, computer, tablet).
- Include using the internet.
- Are in fresh air.
- Are performed in a natural environment (e.g., among plants and trees).

Relaxation

(Responses were rated on a 5-point Likert scale)

- I typically feel calm during the day.
- I typically feel relaxed during the day.
- I typically feel at ease in my daily life.
- I typically feel peaceful throughout the day.
- I typically feel content with how things are going.
- I typically feel satisfied emotionally on an average day.