

Social Activities Do not Distract Everyone from Work

A Diary Study of Work-Related Perseverative Cognition

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Abstract

Work-related perseverative cognition (WPC) involves rumination about the past and worry about the future regarding workplace issues. Such cognition impedes workers' daily recovery and well-being as it fosters prolonged activation of psychological stressors during leisure time. Considering these detrimental effects, it is important, for both theoretical and practical considerations to highlight coping strategies that individuals can use to reduce daily WPC. Previous studies have led to contradictory results regarding the potential of social activities to decrease daily WPC. The aim of this study was to bring new insights on these results by examining how the benefits from time spent on social activities (i.e., reducing WPC) vary according to an individual's level of neuroticism. A total of 48 daytime workers from a Canadian university completed evening diaries on 10 days during two consecutive workweeks (316 data points). Participants recorded the number of minutes spent on social activities after each workday and the extent to which a series of WPC had crossed their mind during the evening. Results from Hierarchical Linear Modeling (HLM) analyses revealed that time spent on social activities was associated to a daily decrease of WPC for workers low in neuroticism but to an increase of WPC for those high in neuroticism. This study suggests that workers high in neuroticism may be less likely to benefit from social activities. The discussion focuses on why potentially protective mechanisms associated with social activities may not be helpful to them. Practical implications based on individuals' level of neuroticism are offered.

Keywords: neuroticism, social activities, work-related perseverative cognition, workers, diary study

1. Introduction

Daily Work-related Perseverative Cognition (WPC) involves rumination about the past and worry about the future regarding workplace issues (Flaxman, Ménard, Kinman, & Bond, 2012). This condition drains cognitive and emotional energy as they promote prolonged activation of psychological stressors during respite periods (Brosschot, Pieper, & Thayer, 2005). This prolonged activation may eventually lead to health problems such as cardiovascular disorders and depression (Brosschot et al., 2005; Nepon, Flett, Hewitt, & Molnar, 2011; Nolan, Roberts, & Gotlib, 1998; Roelofs, Huibers, Peeters, Arntz, & van Os, 2008). To prevent these, it is important to find concrete coping strategies that workers can use to reduce WPC on a daily basis. Research has shown that pursuing some types of daily activities after work can help workers to disengage from work-related issues (Sonnentag & Bayer, 2005). For instance, physical activities such as endurance and fitness training can be an effective distraction from work-related issues (e.g., Feuerhahn, Sonnentag, & Woll, 2014; Ten Brummelhuis & Bakker, 2012). However, studies have found conflicting evidence regarding the benefits of time spent on social activities (e.g., speaking with a friend on the phone). On the one hand, the amount of time spent on social activities during the evening and on the weekend has been positively related to workers' psychological detachment from work (e.g., Mojza, Lorenz, Sonnentag, & Binnewies, 2010; Ten Brummelhuis & Bakker, 2012). However, other studies have failed to confirm such benefits (Mojza, Sonnentag, & Bornemann, 2011; Sonnentag & Bayer, 2005). In spite of those inconsistent results, social activities are commonly seen as attenuating the stress-ill health relationship (Iso-Ahola & Park, 1996) because they may increase opportunities for social support (Sonnentag, 2001) and distract from stressful issues in general (Nolen-Hoeksema, Parker, & Larson, 1994). To

understand these conflicting results other variables such as individual differences should be taken into consideration.

In an effort to address this caveat, the present study posits that the beneficial effects of daily time spent on social activities on WPC differ according to workers' degree of neuroticism (Martin & Tesser, 1989). This assumption is based on numerous studies that have shown that neuroticism, the tendency to experience emotional distress and instability, is positively related to the frequency of worry and rumination (Conway, Csank, Holm, & Blake, 2000; Keogh, French, & Reidy, 1998; Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Roelofs et al., 2008). Thus, since individuals high in neuroticism are more prone to worry and rumination, they are less likely to be distracted by social activities and to experience a contingent reduction of WPC. As those high in neuroticism may focus on and verbalize worries through negative conversations with friends and relatives (Zellars & Perrewé, 2001), they are likely to report more WPC when engaging in social activities.

The aim of this study was to reconcile previous conflicting findings regarding the influence of daily time spent on social activities on WPC by challenging the common assumption that social activities potentially benefit all workers no matter their personal characteristics. A diary study was conducted among a sample of office support staff to investigate the daily association of time spent on social activities and WPC while accounting for individuals' level of neuroticism. The reasons behind the choice of population for this study are threefold. First, in order to study evening social activities, it is necessary to study a population that has fixed schedules and enough time after work to devote to social activities. Second, office support staff represents a large proportion of the Canadian work force (Government of Canada, 2016). Thus, conclusions from this study could apply to an important number of workers. Third, perceived control and job stressors (e.g., workload) experienced by this population are recognized as predictors of workers' negative reactions (e.g., lower job satisfaction; Spector, 1987), that are strongly related to perseverative cognition (Kirkegaard Thomsen, 2006). As for the method, diary studies allow gathering data in workers' natural life contexts and to observe relationships between stable variables (i.e., neuroticism) with transient experiences and states (i.e., daily WPC; Ohly, Sonnentag, Niessen, & Zapf, 2010).

1.1 Theoretical Perspectives on Work-Related Perseverative Cognition

Perseverative cognition refers to recurrent and chronic activation of cognitive representations of psychological stressors through rumination about the past and worry about the future over a prolonged period of time (Brosschot, Gerin, & Thayer, 2006). One of the most recognized antecedents of perseverative cognition is the number of stressors (e.g., workload) faced by the individual, as stressors foster distress and generate issues to ruminate (Nolen-Hoeksema et al., 1994). According to Brosschot et al. (2006), individuals tend to sustain perseverative cognition since they believe it is a useful strategy for problem-solving. Three functions of perseverative cognition have been established (Tallis & Eysenck, 1994). First, worry has an alarm function, as it interrupts current behaviors to allow a response to an urgent problem or threat. Second, worry has a prompting function, as it sustains attention on an unresolved and threatening situation. Third, worry has a preparatory function, as it prepares the organism to respond to the threatening situation. Individuals who face multiple stressors (e.g., time pressure and workload) are often too cognitively overwhelmed to engage in coping strategies that could help them reduce perseverative cognition (Nolen-Hoeksema et al., 1994). Therefore it fosters prolonged activation of psychological stressors and may lead to negative outcomes such as impaired concentration, negatively biased thinking, decreased recovery and depressive symptoms (Flaxman et al., 2012; Papageorgiou & Siegle, 2003).

The Conservation of Resources Theory (COR; Hobföll, 1989) helps to explain why perseverative cognition leads to such negative outcomes. According to COR people strive to preserve and gain resources. Wellness and well-being comes from resources gain and accumulation and ill-health and stress comes from resources' loss and deprivation. Working may be stressful as it calls upon resources (Westman, Hobföll, Chen, Davidson, & Laski, 2004). In order to recover and remain healthy, workers need to regain resources between workdays (Binnewies, Sonnentag, & Mojza, 2010). Worrying and ruminating when the workday is over call for even more resources from workers and prevent them from regaining resources before the next work period (Sonnentag, Binnewies, & Mojza, 2010).

To prevent the detrimental effects of WPC on workers' health and well-being, efficient coping strategies to reduce WPC need to be found. The next section focuses on how time spent on social activities may reduce WPC among workers.

1.2 Theoretical Perspectives on Daily Time Spent on Social Activities

Findings from previous studies suggest that engaging in leisure activities is one strategy that individuals may choose to adopt in order to reduce WPC between work periods (Mojza et al., 2010; ten Brummelhuis & Bakker, 2012). Social activities, defined as actions involving interactions with others (e.g., speaking on the phone, meeting people or going out with friends; Nakahara, 2013), can enhance the ability to cognitively detach from work-related issues (Sonnetag & Bayer, 2005). According to Martin and Tesser (1996), one explanation why social activities may reduce perseverative cognition is that they help distract individuals from current disturbing issues. Another explanation may be that the interpersonal contact involved in social activities provides opportunities for receiving support (Sonnetag, 2001). Social support has been shown to buffer stress (Cohen & Wills, 1985) and relieve the effects of stressors (Viswesvaran, Sanchez, & Fisher, 1999). According to Greenhaus and Powell's (2006) theory of work-family enrichment, individuals can use their social capital (i.e., goodwill resulting from social relationships that has the capacity to motivate action) gained during off-job activities to solve problems at work. For instance, family and friends offering tips and recommendations necessary for overcoming a given problem at work might prevent or mitigate a work-related stress response. However, while social activities provide both opportunities for distraction and support, some studies have failed to confirm the protective function of such activities on daily WPC (e.g., Mojza et al., 2011; Sonnetag & Bayer, 2005). Considering the role of neuroticism in this equation will shed new light on these conflicting results.

1.3 Theoretical Perspectives on Neuroticism

Neuroticism is a personality trait defined as the tendency to be emotionally unstable (Watson & Clarke, 1984). This trait is associated with the feeling of not being able to cope with life adversities and therefore to be more vulnerable to psychological distress (David, Green, Martin, & Suls, 1997; Watson & Clarke, 1984). Those high in neuroticism are known to be more likely to interpret life events negatively, to worry, to display emotionally charged behaviors and to report more negative thoughts than those low in neuroticism (Bishop & Jeanrenaud, 1976; Watson & Clarke, 1984).

Neuroticism is strongly correlated to perseverative cognition (Hervas & Vazquez, 2011; Muris et al., 2005). Roberts, Gilboa and Gotlib (1998) have suggested that as individuals high in neuroticism tend to focus on their dysphoric experiences, perseverative cognition may be the most frequent cognitive manifestation of this personality trait. In fact, perseverative cognition may be the pathway through which neuroticism impairs psychological health (Barnhofer & Chittka, 2010; Muris et al., 2005; Nolan et al., 1998; Roberts et al., 1998; Roelofs et al., 2008).

Robinson (2007) suggested that the relationship between neuroticism and perseverative cognition is based on a difference in executive cognitive function. Thus, a low level of executive cognitive function among those high in neuroticism may restrict their ability to control their cognition, leading to perseverative cognition. Furthermore, Robinson et al. (2006) proposed that cognitive persistence alter the ability of individuals high in neuroticism to adopt new and adaptive action patterns, thereby increasing their vulnerability to stress-related diseases. Consistent with this explanation, Zellars and Perrewé (2001) stated that as people higher in neuroticism seek more reassurance and are more likely to express statements of victimization than their stable counterparts they tend to have more work-related and negative conversations over the course of social interactions with their relatives. Accordingly since individuals high in neuroticism use such ineffective coping strategies during social interactions, they may fail to benefit from the distracting potential of social activities.

Studies have shown that neuroticism also influences how much one perceives social support (Procidano & Heller, 1983; Swickert, Hittner, & Foster, 2010). Comparisons between received (actual) support and perceived support revealed that individuals high in neuroticism report being less supported than they actually are (Bolger & Eckenrode, 1991). According to Bolger and Eckenrode (1991), those high in neuroticism tend to have a more negative mood. Consequently, they are more prone to negative bias in social judgments and tend to report dissatisfaction with the social support they receive during social interactions. Accordingly, individuals higher in neuroticism are less likely to benefit from the buffering effect of social support during interpersonal activities (Cohen & Wills, 1985).

1.4 This Study

In sum, the current state of knowledge suggests that the interaction between neuroticism and social activities leads to divergent outcomes on daily WPC but this has not yet been tested and could be of considerable importance when counseling individuals on efficient ways to deal with WPC. Thus, the following moderation hypothesis was posited:

Hypothesis 1: Devoting more time than one's personal average to social activities will lead to lower daily WPC but only for individuals with low levels of self-reported neuroticism. Thus, participants low in neuroticism will report less daily WPC when they spent more time than their own personal average on social activities, while those high in neuroticism will report more daily WPC on days when more time is spent on social activities after the workday.

2. Method

2.1 Participants

Following the recommendations of Sheble and Wildemuth (2009), an evening diary study was conducted over a 10-day period (two consecutive workweeks from Monday to Friday) to test the hypothesis. Participants were office support staff from a Canadian university. Inclusion criteria were the following: (a) intending to work on a majority of days during the two weeks in which the diaries were to be completed, (b) being at least 18 years old, and (c) having Internet access at home, in order to complete the electronic surveys. A total of 61 workers volunteered for the diary study and received the questionnaires through their personal email address. Among the 61 workers who volunteered, 55 completed the initial questionnaire and 48 completed both the initial questionnaire and electronic diaries. A total of 316 (out of a maximum of 480) data points were obtained. Little's MCAR test (Little, 1988) indicated that data were missing completely at random, $\chi^2 = 4.11$ ($df = 3$, $p = .250$). Most participants were female (70.8%) and their average age was 41.5 years ($SD = 11.06$). Most had children (64.2%), were married or had a partner (66.7%) and worked full-time (93.8%) for an average of 39 hours ($SD = 7.8$) per week. Descriptive statistics are presented in Table 1.

2.2 Procedure

The Institutional Review Board of Université du Québec à Montréal's Human Sciences Faculty approved this project. The research team sent an email to office support staff using the university's official email list. The email presented the major goals of the research project. Volunteers were asked to provide their email address to the research assistant in order to receive access to the initial questionnaire and the diaries on the online software Survey Monkey. The first page of the initial questionnaire informed participants about confidentiality and anonymity measures. Participants were also instructed to complete the initial questionnaire during the first weekend of the study and daily diaries before going to bed on work days of two consecutive weeks, from Monday to Friday. Time of completion was automatically recorded by the web-based questionnaire platform. Each completed daily diaries gave a chance to win a prize (2 X 50\$). Control variables and neuroticism were assessed in the initial questionnaire. The diaries were completed at bedtime in order to assess participants' level of WPC after the workday and the amount of time spent on social activities.

2.3 Measures

2.3.1 Self-Reported Neuroticism

Neuroticism was assessed using the Neuroticism-Anxiety (N-Anx) subscale from Zurkerman-Kuhlman's Personality Questionnaire (ZKPQ; Aluja et al., 2006). It consists of ten items rated on a four-point Likert scale ranging from 1 ("Totally disagree") to 4 ("Totally agree"), for example: "I often feel restless for no apparent reason". The Cronbach's alpha of this subscale ($\alpha = .89$) was similar to that in the original study ($\alpha = .83$; Aluja et al., 2006).

2.3.2 Daily Work-Related Perseverative Cognition (WPC)

The five-item Work-related Worry and Rumination Scale (WWRS; Flaxman et al., 2012) was used (e.g., "I worried about things to do with work."). Each evening before sleep over two consecutive workweeks, participants had to indicate the extent to which a series of work-related thoughts had crossed their mind after their workday on a five-point Likert scale ranging from 1 ("Not at all") to 5 ("A great deal"). The original scale had a Cronbach's alpha of .86, and the current diary study revealed alphas varying from .66 to .97 across all ten measurement occasions.

2.3.3 Daily Time Spent on Social Activities

Following the procedure used by Sonnentag (2001), participants were provided with a list of three prototypical social activities (i.e., speaking with someone on the phone, speaking with someone face-to-face and intimacy/affection with one's partner). Each evening before sleep over two consecutive workweeks, participants recorded the amount of time (in minutes) spent on each type of activities after their workday (i.e., in the evening until bedtime) for a total of ten daily scores.

2.3.4 Control Variables

Heavy workload is defined as having to do a great amount of work in a short period of time and is a job strain often experienced as general time pressure (Sonnentag & Krueger, 2006). Chronic workload is defined as a more permanent level of workload that is experienced every day (Sonnentag & Bayer, 2005). Heavy workload has been shown to be one of the job stressors with the most detrimental consequences on WPC (e.g., Cropley, Dijk, & Stanley, 2006; Cropley & Millward Purvis, 2003; Sonnentag & Bayer, 2005; Sonnentag & Krueger, 2006; Steptoe, Cropley, & Joeke, 1999). Thus, chronic workload was controlled in the analyses. It was assessed in the initial questionnaire using the workload subscale from the Job Content Questionnaire (JCQ) developed by Karasek et al. (1998). A sample item is: "My job requires working very hard". Response scale ranged from 1 ("Strongly disagree") to 4 ("Strongly agree"). Reliability was good (Cronbach's alpha = .79), and similar to that of the original (Cronbach's alpha = .84; Niedhammer, 2002).

Demographic variables may also have an influence on individuals' level of thoughts about work-related issues (Sonntag & Bayer, 2005; Sonntag & Krueger, 2006). Therefore, age, gender, number of children, hours of work per week, and contract working hours (i.e., full-time or part-time) were included in the analyses.

2.4 Data Analyses

2.4.1 Correlation Analyses

Preliminary analyses were performed using SPSS v.23 (IBM Corp., 2015). Correlation analyses were conducted in order to assess the strength of the relationships between variables. Spearman's correlation coefficients were used for ordinal data (i.e., gender and contract working hours) and Pearson's correlation coefficients were used for interval variables (i.e., age, number of children, hours of work/week, workload, neuroticism, social activities, and perseverative cognition). Scores obtained on the 10 measurement occasions were aggregated for each Level 1 variable to compute correlations between Level 1 and Level 2 variables.

2.4.2 Hierarchical Linear Models

A series of hierarchical linear models (HLM) were constructed using HLM 7 (Raudenbush, Bryk, & Congdon, 2011) to evaluate the extent to which data supported the hypothesis. This type of analytical model is the most common in diary studies (Ohly et al., 2010). HLM control for missing data at the group-level and take into account dependence between measurement occasions making it possible to assess the fluctuations between days for the same individual (Field, 2009; Reis & Gable, 2000). Following Ohly et al.'s (2010) recommendations when intra-individual variance (Level 1) is of primary interest in a moderation hypothesis, daily time spent on social activities (predictor) was centered to the group mean (within-person level of analysis) and neuroticism (moderator) was centered to the grand mean (between-person level). The control variables were centered to the grand mean (between-person level). In doing so, all between-person variance was removed. The estimation method used was restricted maximum likelihood (e.g., Trougakos, Hideg, Cheng, & Beal, 2014). The random effect of the intercept and slopes were included in the analyses. Equations were tested in a two-tailed manner. The following equations were used:

$$\text{Level 1: Daily WPC}_{ij} = \beta_{0j} + \beta_{1j}(\text{Daily Time Spent on Social Activities})_{ij} + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00}(\text{Chronic Workload}) + \gamma_{01}(\text{Neuroticism}) + u_{0j}$$

3. Results

3.1 Correlation Analyses

Zero-order correlations and descriptive statistics are presented in Table 1. The coefficient above the diagonal is the day-level correlation between social activities and WPC. The pattern of correlations was in line with expectations. Social activities were not related to WPC at the between level ($r = -.02, p = \text{n.s.}$) and at the day-level ($r = -.04, p = \text{n.s.}$). Also, neuroticism was positively related to WPC ($r = .41, p = .004$). Age ($r = -.39, p = .009$) and gender ($r = .32, p = .034$) were significantly related to time spent on social activities, with younger, and male office support workers devoting more time to them. Workload was marginally correlated to daily WPC ($r = .28, p = .058$). Since workload was related (although marginally) to daily WPC, it was decided to include it in the hierarchical linear models.

Table 1. Cronbach alpha, means, standard deviations, and zero-order correlations

Variables	α	M	SD	1	2	3	4	5	6	7	8	9
Socio-demographic variables												
1. Age		41.49	11.03	–								
2. Gender		1.29	.46	.07	–							
3. Number of children		1.06	1.17	.15	.17	–						
4. Part-time / full-time		1.06	.24	-.22	.02	-.26	–					
5. Hours of work / week		38.98	7.79	.17	.32*	.24	-.23	–				
Control variable												
6. Workload	.79	2.57	.55	-.07	-.07	.16	-.15	.05	–			
Model's variables												
7. Neuroticism	.90	2.13	.63	-.15	-.23	-.18	-.07	-.02	.26	–		
8. Daily WPC	.66 to .97	1.31	.38	.01	-.00	.01	-.15	.05	.28	.41**	–	-.04
9. Daily time spent on social activities		66.94	44.58	-.39**	.32*	-.18	.14	-.08	.00	-.04	-.02	–

Notes. α = Cronbach's alpha variation across the 10 days of the study. Gender = woman (1), man (2). Full-time/part-time = part-time employment (0) full-time employment (1). Daily time spent on social activities is in minutes. * = significant at $p < .05$. ** = significant at $p < .01$. Correlations below the diagonal are at the person-level (average across 10 days; $n = 48$). Correlation above the diagonal is at the day-level ($n = 316$).

Table 2. Results from the HLM analyses of daily WPC before going to bed over 2 consecutive weeks

Variables	Null model			Model 1			Model 2			Model 3			Model 4		
	Coef.	t	p	Coef.	t	p	Coef.	t	p	Coef.	t	p	Coef.	t	p
Intercept	1.32	24.28	<.001	1.32	25.22	<.001	1.32	25.24	<.001	1.32	27.14	<.001	1.32	27.13	<.001
Workload				0.11	2.35	.023	.11	2.28	.027	0.08	1.78	.081	.08	1.81	.077
Daily time spent on social activities							.01	0.45	.653				.01	0.41	.681
Neuroticism										.13	2.42	.020	.13	2.41	.020
Daily time spent on social activities X Neuroticism													.04	2.56	.014

Notes. Coef. = Coefficient. Daily time spent on social activities is in minutes. n at Level 1 = 316. n at Level 2 = 48.

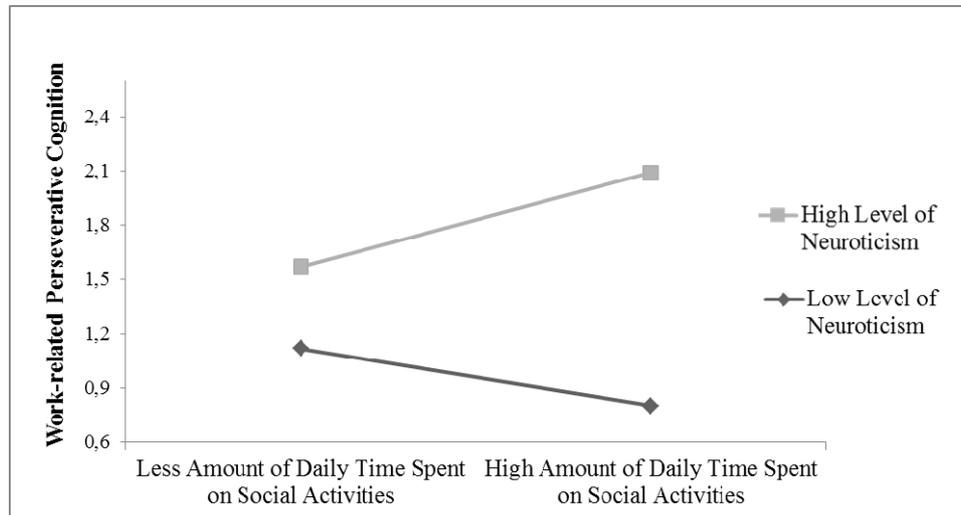


Figure 1. Impact of daily time spent on social activities on daily WPC as a function of neuroticism

3.2 Hierarchical Linear Models

Hierarchical linear models were used in order to verify Hypothesis 1 which posits that spending more time than one's personal average to daily social activities will lead to lower daily WPC but only for individuals low in neuroticism. As hypothesized, neuroticism significantly moderated the relation between daily time spent on social activities and daily WPC ($\gamma_{11} = .04, p = .014$). Results are presented in Table 2 and in Figure 1 (with high and low scores at one standard deviation above and below the mean; Aiken & West, 1991). For participants high in neuroticism, each unit increase in time invested in social activities led to a .52 increase in daily WPC, in comparison to a decrease of .32 units for those low in neuroticism. Analysis of the simple effects of this interaction at high (+1 SD) and low (-1 SD) levels of neuroticism showed that daily number of minutes spent on social activities significantly predicted daily WPC, both for individuals high in neuroticism ($\gamma_{11} = .04, p = .014$) and low in neuroticism ($\gamma_{11} = .04, p = .014$). Results are discussed in detail in the next section.

4. Discussion

This diary study extends previous findings on perseverative cognition by examining relations between time spent on social activities and perceived daily perseverative cognition about work-related issues in light of individual's level of self-reported neuroticism. This approach illustrates the importance of taking into account both individual strategies that help to distract oneself from work (i.e., through social leisure activities) and personal characteristics (i.e., neuroticism) to understand daily WPC. As predicted, social activities amplified the neuroticism/WPC relationship, exacerbating the tendency of those with high levels of neuroticism to report WPC when spending more time than their personal average on social activities after the workday whereas it decreased among those low in neuroticism. This shows that devoting extensive time to social activities during leisure hours could help workers low in neuroticism manage daily WPC, but could also increase the tendency to experience WPC among those high in neuroticism.

This study sheds new light on previous findings by bringing new insight on why social activities may have been both effective (e.g., Mojza et al., 2010; Ten Brummelhuis & Bakker, 2012) and ineffective (Mojza et al., 2011; Sonnentag & Bayer, 2005) in reducing WPC and promoting resource recovery after work. Results from this study indicate that engaging in social activities does not divert internal reflection from work-related issues in individuals high in neuroticism. This provides empirical support that the effects of leisure activities are influenced by individual characteristics (Sonnentag & Bayer, 2005; Sonnentag & Fritz, 2007). As individuals high in neuroticism tend to engage in conversations about stressful events more frequently and with a more negative outlook than those low in neuroticism, it is likely that the former tend to worry and ruminate during social activities. This may explain why those high in neuroticism fail to take advantage of the social support extended to them (Demerouti, Bakker, Geurts, & Taris, 2009; Zellars & Perrewé, 2001).

Sonnentag and Fritz (2007) suggested that recreational activities are beneficial through the "sense of control" individuals experience when they choose to devote time to an activity, rather than through any inherent benefit. Social activities are less likely to provide a sense of control about work-related issues than working after the

workday, since working may help to reduce the perception of workload for the subsequent workday. The “Zeigarnik effect” (Zeigarnik, 1927) states that individuals recall unfinished tasks more than those that have been completed. Accordingly, working during the evening may help reduce WPC among neurotic workers as it allows them to exert an actual control over their workload. Thus, working after hours may be more beneficial to those high in neuroticism, as they tend to worry and ruminate more about work-related issues than their emotionally stable counterparts (Rusting & Larsen, 1997). However, workers high in neuroticism may sometimes feel pressured to devote time to friends and family members, thereby leaving less time and control for working during the evening.

4.1 Strengths, Limitations and Future Research

Using diaries over two workweeks allowed observing the variability of participants’ WPC in its real context of occurrence (Reis & Gable, 2000). Also, by asking participants to report both activities and WPC shortly after the activities were performed (i.e., in the evening before sleep), potential retrospective bias was reduced (Stone et al., 1998).

Although relevant results were obtained in this diary study, it is important to mention a few limitations. First, because the study has a correlational and longitudinal design, causality cannot be established between the tested variables. Some questions are yet to be answered such as do people who ruminate more engage in more or less social activities depending on their personality? Do people high in neuroticism engage in more social activities on days they ruminate more while people low in neuroticism do not engage in more social activities?

Second, there is a potential bias due to the self-reported nature of the data. At the end of their workday, individuals can experience difficulties to estimate the time spent doing social activities. In future studies, it would be appropriate to use other data collection approaches such as experience sampling method (ESM; see Larson & Csikszentmihalyi, 1983). For instance, researchers can use smartphones based ESM platform and ask participants to stop their activities at certain times and log their experience in real time. In order to triangulate the data, information could also be collected from third parties such as friends or relatives.

Third, sample size may appear as small. However, Ohly et al. (2010) reported that, in a diary studies, a sample size comprised of more than 30 individuals helps to reduce the possibility of biased results and current sample was 316 data points amongst 48 participants.

Fourth, 36.25% of daily diaries (174 out of a maximum of 480) were not completed. However, the neurotic and stressed workers with young children, and also the socially active ones are more likely to omit diary data. Sending a reminder on participants’ smartphone could probably help mitigate such effect.

Fifth, other personal characteristics that have not been considered in the present study could also have influenced the ability of office support staff to take advantage of social activities. Researchers are encouraged to examine some variables such as other big five traits that could influence the function and benefits of activities performed after work. For instance, Trougakos and Hideg (2009) posit that individuals’ level of extraversion (i.e., the extent to which individuals are energetic, assertive, and enthusiastic) may influence the benefits of time spent on social activities during break periods. In comparison to individuals low in extraversion (i.e., introverted individuals), those high in extraversion may prefer to spend time on social types of activities as they perceived them as attractive and as a way to secure social support on which they can rely on during demanding times. According to Hotard et al. (1989) and Lynn and Steel (2006) there may also exist an interactive effect of extraversion and neuroticism on individuals’ level of well-being. Introverts are recognized to interpret social arousal negatively and are thus more likely to avoid social interactions than extroverts. Since individuals high in neuroticism are known to interpret life events, including social activities, more negatively than their stable counterparts (Watson & Clarke, 1984), they may amplify the negative reactions of introverts during social interactions. Neurotic introverts may thus report anxiety when they spent time on social activities during off-job periods, while neurotic extroverts may attribute their arousal during social activities to attraction (Lynn & Steel, 2006).

4.2 Implications and Conclusion

Findings suggest that engaging in social activities does not help all individuals to decrease WPC, known to be detrimental to individuals’ health and well-being (Nepon et al., 2011; Nolan et al., 1998; Roelofs et al., 2008). For workers low in neuroticism, social activities can be beneficial, whereas for workers high in neuroticism, devoting more time to social activities may lead to an increase in WPC. This supports Sonnentag and Fritz’s (2007) statement that no specific leisure activity can consistently generate recovery, because the type of activities experienced as restorative varies among individuals. This study goes further in explaining the absence of direct relation of time spent on social activities observed in previous studies (e.g., Mojza et al., 2011;

Sonnentag & Bayer, 2005), suggesting that some individuals (those high in neuroticism) may be less likely to take advantage of protective mechanisms associated with social activities, thereby failing to improve their well-being.

One practical implication is that the design of interventions aimed at reducing WPC should take into account the individuals' level neuroticism or not. Since workers high in neuroticism have more daily perseverative cognition about work-related issues when devoting more time to social activities, workers should pay particular attention to the nature (positive or negative) of conversations with relatives during their leisure activities. To benefit from the distraction social activities can offer, workers should avoid or at least minimize engaging in negative conversations in this context. Also, previous studies have highlighted other strategies that may reduce WPC among individuals high in neuroticism. For instance, cognitive and behavioural therapies based on mindfulness have been shown to be effective for this purpose (Bond, Flaxman, van Veldhoven, & Biron, 2010). Martin and Tesser (1996) suggested that goal attainment and disengagement from the goal (along with distraction through off-job activities) help individuals reduce their level of WPC. Cropley and Millward Purvis (2009) proposed that goal attainment may be facilitated by splitting work-related tasks into smaller steps that can be performed on a daily basis, while disengagement from job-related issues may be improved with strong and clear boundaries between work and home domains. Once workers have been educated about the detrimental effects of WPC, those who are more prone to engage in such type of thinking should be encouraged to try the proposed strategies.

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References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Aluja, A., Rossier, J. R. M., Garcia, L. F., Angleitner, A., Kuhlman, M., & Zuckerman, M. (2006). A cross-cultural shortened form of the ZKPQ (ZKPQ-50-cc) adapted to English, French, German, and Spanish languages. *Personality and Individual Differences, 41*(4), 619-628. <http://dx.doi.org/10.1016/j.paid.2006.03.001>
- Barnhofer, T., & Chittka, T. (2010). Cognitive reactivity mediates the relationship between neuroticism and depression. *Behaviour Research and Therapy, 48*(4), 275-281. <http://dx.doi.org/10.1016/j.brat.2009.12.005>
- Binnewies, C., Sonnentag, S., & Mojza, E. J. (2010). Recovery during the weekend and fluctuations in weekly job performance: A week level study examining intra individual relationships. *Journal of Occupational and Organizational Psychology, 83*(2), 419-441. <http://dx.doi.org/10.1348/096317909X418049>
- Bishop, D., & Jeanrenaud, C. (1976). End-of-day moods on work and leisure days in relation to extraversion, neuroticism, and amount of change in daily activities. *Canadian Journal of Behavioural Science, 8*(4), 388-400. <http://dx.doi.org/10.1037/h0081964>
- Bolger, N., & Eckenrode, J. (1991). Social relationships, personality, and anxiety during a major stressful event. *Journal of Personality and Social Psychology, 61*, 440-449. <http://dx.doi.org/0022-3514/91>
- Bond, F. W., Flaxman, P. E., van Veldhoven, M. J. P. M., & Biron, M. (2010). The impact of psychological flexibility and acceptance and commitment therapy (ACT) on health and productivity at work. In J. Houdmont, & S. Leka (Eds.), *Contemporary occupational health psychology: Global perspectives on research, education, and practice*. Chichester, UK: Wiley-Blackwell.
- Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research, 60*(2), 113-124. <http://dx.doi.org/10.1016/j.jpsychores.2005.06.074>
- Brosschot, J. F., Pieper, S., & Thayer, J. F. (2005). Expanding stress theory: Prolonged activation and PC. *Psychoneuroendocrinology, 30*(10), 1043-1049. <http://dx.doi.org/10.1016/j.psyneuen.2005.04.008>
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310-357. <http://dx.doi.org/10.1016/j.psyneuen.2015.10.005>
- Conway, M., Csank, P. A., Holm, S. L., & Blake, C. K. (2000). On assessing individual differences in rumination on sadness. *Journal of Personality Assessment, 75*(3), 404-425. http://dx.doi.org/10.1207/S15327752JPA7503_04

- Cropley, M., & Millward Purvis, L. (2003). Job strain and rumination about work issues during leisure time: A diary study. *European Journal of Work and Organizational Psychology*, 12(3), 195-207. <http://dx.doi.org/10.1080/13594320344000093>
- Cropley, M., & Millward, L. J. (2009). How do individuals “switch-off” from work during leisure? A qualitative description of the unwinding process in high and low ruminators. *Leisure Studies*, 28(3), 333-347. <http://dx.doi.org/10.1080/02614360902951682>
- Cropley, M., Dijk, D. J., & Stanley, N. (2006). Job strain, work rumination, and sleep in school teachers. *European Journal of Work and Organizational Psychology*, 15(2), 181-196. <http://dx.doi.org/10.1080/13594320500513913>
- David, J., Green, P. J., Martin, R., & Suls, J. (1997). Differential roles of neuroticism extraversion, and event desirability for mood in daily life: An integrative model of top-down and bottom up influences. *Journal of Personality and Social Psychology*, 73, 149-159. <http://dx.doi.org/10.1177/1754073913477512>
- Demerouti, E., Bakker, A. B., Geurts, S. A., & Taris, T. W. (2009). Daily recovery from work-related effort during non-work time. *Current Perspectives on Job-Stress Recovery: Research in Occupational Stress and Well-being*, 7, 85-123. [http://dx.doi.org/10.1108/S1479-3555\(2009\)0000007006](http://dx.doi.org/10.1108/S1479-3555(2009)0000007006)
- Feuerhahn, N., Sonnentag, S., & Woll, A. (2014). Exercise after work, psychological mediators, and affect: A day-level study. *European Journal of Work and Organizational Psychology*, 23(1), 62-79. <http://dx.doi.org/10.1080/1359432X.2012.709965>
- Field, A. (2009). *Discovering statistics using SPSS*. London, UK: Sage publications.
- Flaxman, P. E., Ménard, J., Kinman, G., & Bond, F. W. (2012). Academic’s experiences of a respite from work: Effects of self-critical perfectionism and PC on post-respite well-being. *Journal of Applied Psychology*, 97(4), 854-865. <http://dx.doi.org/10.1037/a0028055>
- Government of Canada. (2016). *Canadian Occupational Projection System (COPS)*. Retrieved from <http://occupations.esdc.gc.ca/sppc-cops/4cc.5p.1t.3.4ns.5mm.1ryd.2t.1.3l@-eng.jsp?tid=53>
- Greenhaus, J. H., & Powell, G. N. (2006). When work and family are allies: A theory of work-family enrichment. *Academy of Management Review*, 31(1), 72-92. <http://dx.doi.org/10.5465/AMR.2006.19379625>
- Gunthert, K. C., Cohen, L. H., & Armeli, S. (1999). The role of neuroticism in daily stress and coping. *Journal of Personality and Social Psychology*, 77(5), 1087-1100. <http://dx.doi.org/10.1037/0022-3514.77.5.1087>
- Hervas, G., & Vazquez, C. (2011). What else do you feel when you feel sad? Emotional overproduction, neuroticism and rumination. *Emotion*, 11(4), 881-895. <http://dx.doi.org/10.1037/a0021770>
- Hobföll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, 44(3), 513-524. <http://dx.doi.org/10.1037/0003-066X.44.3.513>
- Hotard, S. R., McFatter, R. M., McWhirter, R. M., & Stegall, M. E. (1989). Interactive effects of extraversion, neuroticism, and social relationships on subjective well-being. *Journal of Personality and Social Psychology*, 57(2), 321-333. <http://dx.doi.org/10.1037/0022-3514.57.2.321>
- IBM Corp. (2015). *IBM SPSS Statistics for Windows, Version 23.0*. Armonk, NY: IBM Corp.
- Iso-Ahola, S., & Park, C. J. (1996). Leisure-related social support and self-determination as buffers of stress-illness relationship. *Journal of Leisure Research*, 28(3), 169-187. <http://dx.doi.org/10.3402/qhw.v9.23517>
- Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, 3(4), 322-355. <http://dx.doi.org/10.1037/1076-8998.3.4.322>
- Keogh, E., French, C. C., & Reidy, J. (1998). Predictors of worry. *Anxiety, Stress, and Coping*, 11(1), 67-80. <http://dx.doi.org/10.1080/10615809808249314>
- Kirkegaard Thomsen, D. (2006). The association between rumination and negative affect: A review. *Cognition and Emotion*, 20(8), 1216-1235. <http://dx.doi.org/10.1080/02699930500473533>
- Larson, R., & Csikszentmihalyi, M. (1983). The experience sampling method. In H. T. Reis (Ed.), *Naturalistic approaches to studying social interaction. New directions for methodology of social and behavioral sciences* (pp. 41-56). San Francisco, CA: Jossey-Bass.

- Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, 83(404), 1198-1202. <http://dx.doi.org/10.1080/01621459.1988.10478722>
- Lynn, M., & Steel, P. (2006). National differences in subjective well-being: The interactive effects of extraversion and neuroticism. *Journal of Happiness Studies*, 7(2), 155-165. <http://dx.doi.org/10.1007/s10902-005-1917-z>
- Martin, L. L., & Tesser, A. (1989). Toward a motivational and structural theory of ruminative thought. In J. Uleman, & J. A. Bargh (Eds.), *Unintended thought* (pp. 306-326). New York, NJ: Guilford Press.
- Martin, L. L., & Tesser, A. (1996). Some ruminative thoughts. In Robert S. Jr. W. (Ed.), *Ruminative thoughts. Advances in social cognition* (pp. 1-47). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.
- Mojza, E. J., Lorenz, C., Sonnentag, S., & Binnewies, C. (2010). Daily recovery experiences: The role of volunteer work during leisure time. *Journal of Occupational Health Psychology*, 15(1), 60-74. <http://dx.doi.org/10.1037/a0017983>
- Mojza, E. J., Sonnentag, S., & Bornemann, C. (2011). Volunteer work as a valuable leisure-time activity: A day-level study on volunteer work, non-work experiences, and well-being at work. *Journal of Occupational and Organizational Psychology*, 84(1), 123-152. <http://dx.doi.org/10.1348/096317910X485737>
- Muris, P., Roelofs, J., Rassin, E., Franken, I., & Mayer, B. (2005). Mediating effects of rumination and worry on the links between neuroticism, anxiety and depression. *Personality and Individual Differences*, 39(6), 1105-1111. <http://dx.doi.org/10.1016/j.paid.2005.04.005>
- Nakahara, J. (2013). Effects of social activities outside the home on life satisfaction among elderly people living alone. *International Journal of Psychological Studies*, 5(1), 112-120. <http://dx.doi.org/10.5539/ijps.v5n1p112>
- Nepon, T., Flett, G. L., Hewitt, P. L., & Molnar, D. S. (2011). Perfectionism, negative social feedback, and interpersonal rumination in depression and social anxiety. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 43(4), 297-306. <http://dx.doi.org/0008-400X/11>
- Niedhammer, I. (2002). Psychometric properties of the French version of the Karasek Job Content Questionnaire: A study of the scales of decision latitude, psychological demands, social support, and physical demands in the GAZEL cohort. *International Archives of Occupational and Environmental Health*, 75(3), 129-144. <http://dx.doi.org/10.1007%2Fs004200100270>
- Nolan, S. A., Roberts, J. E., & Gotlib, I. H. (1998). Neuroticism and ruminative response style as predictors of change in depressive symptomatology. *Cognitive Therapy and Research*, 22(5), 445-455. <http://dx.doi.org/10.1023%2FA%3A1018769531>
- Nolen-Hoeksema, S., Parker, L. E., & Larson, J. (1994). Ruminative coping with depressed mood following loss. *Journal of Personality and Social Psychology*, 67(1), 92-104. <http://dx.doi.org/0022-3514/94>
- Ohly, S., Sonnentag, S., Niessen, C., & Zapf, D. (2010). Diary studies in organizational research: An introduction and some practical recommendations. *Journal of Personnel Psychology*, 9, 79-93. <http://dx.doi.org/10.1027/1866-5888/a000009>
- Papageorgiou, C., & Siegle, G. J. (2003). Rumination and depression: Advances in theory and research. *Cognitive Therapy and Research*, 27(3), 243-245. <http://dx.doi.org/10.1023/A:1023918331490>
- Procidano, M. E., & Heller, K. (1983). Measures of perceived social support from friends and from family: Three validation studies. *American Journal of Community Psychology*, 11(1), 1-24. <http://dx.doi.org/10.1007/BF00898416>
- Raudenbush, S. W., Bryk, A. S., & Congdon, R. (2011). *HLM 7 for Windows* [Computer software]. Lincolnwood, IL: Scientific Software International, Inc.
- Reis, H. T., & Gable, S. (2000). Event-sampling and other methods for studying everyday experience. In H. T. Reis, & C. M. Judd (dir.), *Handbook of research methods in social and personality psychology* (pp. 190-222). United Kingdom: Cambridge university press.
- Roberts, J. E., Gilboa, E., & Gotlib, I. H. (1998). Ruminative response style and vulnerability to episodes of dysphoria: Gender, neuroticism, and episode duration. *Cognitive Therapy and Research*, 22(4), 401-423. <http://dx.doi.org/10.1023/A:1018713313894>

- Robinson, M. D. (2007). Personality, affective processing, and self-regulation: Toward process-based views of extraversion, neuroticism, and agreeableness. *Social and Personality Psychology Compass*, 1(1), 223-235. <http://dx.doi.org/10.1111/j.1751-9004.2007.00019.x>
- Robinson, M. D., Wilkowski, B. M., Kirkeby, B. S., & Meier, B. P. (2006). Stuck in a rut: Perseverative response tendencies and the neuroticism-distress relationship. *Journal of Experimental Psychology: General*, 135(1), 78-91. <http://dx.doi.org/10.1037/0096-3445.135.1.78>
- Roelofs, J., Huibers, M., Peeters, F., Arntz, A., & van Os, J. (2008). Rumination and worrying as possible mediators in the relation between neuroticism and symptoms of depression and anxiety in clinically depressed individuals. *Behaviour Research and Therapy*, 46(12), 1283-1289. <http://dx.doi.org/10.1016/j.brat.2008.10.002>
- Rusting, C. L., & Larsen, R. J. (1997). Extraversion, Neuroticism, and susceptibility to positive and negative affect: A test of two theoretical models. *Personality and Individual Differences*, 22(5), 607-612. [http://dx.doi.org/10.1016/S0191-8869\(96\)00246-2](http://dx.doi.org/10.1016/S0191-8869(96)00246-2)
- Sheble, L., & Wildemuth, B. (2009). Research diaries. In B. Wildemuth (Ed.), *Applications of social research methods to questions in information and library science* (pp. 211-221). Santa Barbara, CA: Libraries Unlimited.
- Sonnentag, S. (2001). Work, recovery activities, and individual well-being: A diary study. *Journal of Occupational Health Psychology*, 6(3), 196-210. <http://dx.doi.org/10.1037/1076-8998.6.3.196>
- Sonnentag, S., & Bayer, U. V. (2005). Switching off mentally: Predictors and consequences of psychological detachment from work during off-job time. *Journal of Occupational Health Psychology*, 10(4), 393-414. <http://dx.doi.org/10.1037/1076-8998.10.4.393>
- Sonnentag, S., & Fritz, C. (2007). The Recovery Experience Questionnaire: Development and validation of a measure for assessing recuperation and unwinding from work. *Journal of Occupational Health Psychology*, 12(3), 204-221. <http://dx.doi.org/10.1037/1076-8998.12.3.204>
- Sonnentag, S., & Krueger, U. (2006). Psychological detachment from work during off-job time: The role of job stressors, job involvement, and recovery-related self-efficacy. *European Journal of Work and Organizational Psychology*, 15(2), 197-217. <http://dx.doi.org/10.1080/13594320500513939>
- Sonnentag, S., Binnewies, C., & Mojza, E. J. (2010). Staying well and engaged when demands are high: The role of psychological detachment. *Journal of Applied Psychology*, 95(5), 965-976. <http://dx.doi.org/10.1037/a0020032>
- Spector, P. E. (1987). Interactive effects of perceived control and job stressors on affective reactions and health outcomes for clerical workers. *Work & Stress*, 1(2), 155-162. <http://dx.doi.org/10.1080/02678378708258497>
- Steptoe, A., Cropley, M., & Joeckes, K. (1999). Job strain, blood pressure, and responses to uncontrollable stress. *Journal of Hypertension*, 17, 193-200. <http://dx.doi.org/10.1097/00004872-199917020-00003>
- Stone, A. A., Schwartz, J. E., Neale, J. M., Shiffman, S., Marco, C. A., Hickcox, M., ... Cruise, L. J. (1998). A comparison of coping assessed by ecological momentary assessment and retrospective recall. *Journal of Personality and Social Psychology*, 74(6), 1670-1680. <http://dx.doi.org/0022-3514/98>
- Swickert, R. J., Hittner, J. B., & Foster, A. (2010). Big Five traits interact to predict perceived social support. *Personality and Individual Differences*, 48(6), 736-741. <http://dx.doi.org/10.1177/1359105314547244>
- Tallis, F., & Eysenck, M. W. (1994). Worry: Mechanisms and modulating influences. *Behavioural and Cognitive Psychotherapy*, 22(1), 37-56. <http://dx.doi.org/10.1017/S1352465800011796>
- ten Brummelhuis, L. L., & Bakker, A. B. (2012). Staying engaged during the week: The effect of off-job activities on next day work engagement. *Journal of Occupational Health Psychology*, 17(4), 445-455. <http://dx.doi.org/10.1037/a0029213>
- Trougakos, J. P., & Hideg, I. (2012). Momentary work recovery: The role of within-day work breaks. In P. Perrewé, D. Ganster, & S. Sonnentag (Eds.), *Research in occupational stress and wellbeing* (pp. 37-84). US: JAI Press/Elsevier.
- Trougakos, J. P., Hideg, I., Cheng, B. H., & Beal, D. J. (2014). Lunch breaks unpacked: The role of autonomy as a moderator of recovery during lunch. *Academy of Management Journal*, 57(2), 405-421. <http://dx.doi.org/10.5465/amj.2011.1072>

- Viswesvaran, C., Sanchez, J. I., & Fisher, J. (1999). The role of social support in the process of work stress: A meta-analysis. *Journal of Vocational Behavior, 54*(2), 314-334. <http://dx.doi.org/10.1006/jvbe.1998.1661>
- Watson, D., & Clarke, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96*, 465-490. <http://dx.doi.org/10.1037/0033-2909.96.3.465>
- Westman, M., Hobföll, S. E., Chen, S., Davidson, O. B., & Laski, S. (2004). Organizational stress through the lens of conservation of resources (COR) theory. *Research in Occupational Stress and Well-being, 4*, 167-220. [http://dx.doi.org/S1479-3555\(04\)040](http://dx.doi.org/S1479-3555(04)040)
- Wheeler, L., & Reis, H. T. (1991). Self-recording of everyday life events: Origins, types, and uses. *Journal of Personality, 59*, 339-354. <http://dx.doi.org/10.1111/j.1467-6494.1991.tb00252.x>
- Zeigarnik, B. (1927). Über das Behalten von erledigten und unerledigten handlungen. *Psychologische Forschung, 9*(1), 1-85. <http://dx.doi.org/10.1093/jcr/ucv018>
- Zellars, K. L., & Perrewé, P. L. (2001). Affective personality and the content of emotional social support: Coping in organizations. *Journal of Applied Psychology, 86*(3), 459-467. <http://dx.doi.org/10.1037/0021-9010.86.3.45>

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