Work Overload, Job and Leisure Control, and Recovery of Students in a Dual Study Program – Generalization of the Job Demand Control Model into the Leisure Domain[1]

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ABSTRACT

This study generalizes core assumptions of the job demand control model into the leisure domain. 303 students of a dual study program were surveyed in a cross-sectional study with respect to work overload, job and leisure control, psychological detachment from work, and recovery (relaxation and sleep quality). Mediation and moderation analyses were applied to investigate hypothesized relationships. Detachment mediated the detrimental effects of work overload on recovery. Both job and leisure control were confirmed as moderators. Leisure control attenuated the relationship between work overload and sleep quality. Job control exhibited partly unexpected direction of effects. The JDCM buffer effect of leisure control could not be found within the leisure domain but could be confirmed for spillover processes between the work and the leisure domain.

Keywords

Work overload – job control – leisure control – recovery – students

1 Introduction

Four decades ago, Robert Karasek (1979) proposed his well-known job demand control model (JDCM) against the background of severe health impairments due to high job demands and low job control (high strain jobs) in industrial work settings. Two decades later, JDCM was called „the very best of the millennium" in a systematic review of longitudinal studies in the field of job stress research (de Lange et al., 2003). Meanwhile, jobs have substantially changed due to a shift away from industrial mass production toward customized service work (Oeij & Wiezer, 2002). Globalization and technological innovations changed traditional work patterns as well as managerial practices, which allow but also make it necessary to take work responsibilities home into the leisure domain (Pongratz & Voß, 2003). Moreover, employer expectations impose new demands on employees in terms, e.g., of required flexibility in working time, self-regulation as well as self-responsible lifelong learning (Glaser et al., 2019; Höge, 2011; Höge & Hornung, 2015). Against this background, recovery from work is increasingly threatened.

Etzion, Eden and Lapidot (1998) highlighted the importance of psychological recovery from work in order to preserve employee health. Following this claim, Sonnentag and colleagues (Sonnentag & Kruel, 2006; Sonnentag & Fritz, 2007; Sonnentag & Geurts, 2009) fueled empirical research on recovery from work, predominantly by means of diary studies, which identified psychological detachment from work as the main determinant for recovery experiences in leisure time, which in turn improves work engagement and other beneficial attitudes and behaviors back at work (Sonnentag, Venz & Casper, 2017). The stressor-detachment model (SDM; Sonnentag & Fritz, 2015) established psychological detachment as an important mediator in the relationship between job stressors and employee health.

Certain conceptual questions arise with respect to the role of the four dimensions of recovery experiences (Sonnentag & Fritz, 2007). In particular, psychological detachment from work, control over leisure time, and

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relaxation (as well as mastery experiences in leisure activities) seem to be treated like equal components of recovery. However, from our point of view and according to the SDM, psychological detachment from work seems to be the necessary but not sufficient precondition for recovery, whereas relaxation might be regarded as the most suitable indicator for recovery itself. Moreover, following the core assumption of the buffering effect of job control in JDCM, control over leisure time (for short: leisure control) might be the comparable moderator in the relationship between (a lack of) detachment (as a potential leisure stressor) and well-being (relaxation) within the leisure domain.

As already mentioned, the nature of work has changed considerably: temporal and spatial boundaries between work and non-work domains become increasingly obliterated (Stansfeld & Candy, 2006), and work takes more time than in previous eras, resulting in reductions of overall energy and capacity to relax, which is associated with consequences for both professional and non-professional life (Richardson, 2017). Especially for university students, the ability to distinguish between work and private time represents a major challenge (Gumz et al., 2012). Students experience more stress than the general population (Herbst et al., 2016). Results of a study on student burnout (Gusy et al., 2010) revealed that 41% of a cohort of 1101 undergraduate students scored high on exhaustion, with high academic demands and low autonomy and social support as predictors. Risk factors for health impairment of university students include overtime work, time pressure, and the inability to accomplish academic studies while maintaining a private life (Gusy et al., 2016).

The opportunity to combine classroom and industry-based training has become increasingly attractive to young people, and dual programs featuring both academic study and employment can provide unique insights into the working world as well as the possibility to acquire critical transferable skills (Organization for Economic Cooperation and Development, 2020). However, despite the steady increase in the numbers of students enrolled in dual study programs, there are only few studies which focus on stressors and available resources for this group (Grützmacher et al., 2018). Students in dual study programs with multiple role requirements of concomitant employment and academic study might be a prototypical sample for today´s increasing demands for self-regulation and lifelong learning at work, but at the price of an increased risk for adverse health effects.

1.1 Aims of the study

Our primary goal of this study is to extend or generalize core assumptions of the JDCM from the work into the leisure domain. Building on the SDM by Sonnentag and Fritz (2015), we argue that the relationship between job stressors and health impairment, which is mediated by psychological detachment from work, is moderated (buffered) by job control in the work domain and by leisure control in the leisure domain. Thus, we distinguish between two different types of control that can be exerted over the work environment or over leisure time, respectively.

Second, we aim to disentangle dimensions of recovery experiences (Sonnentag & Fritz, 2007) such that psychological detachment from work is regarded a necessary but not sufficient component for recovery, whereas relaxation (and sleep quality) are suitable proxies for recovery, and leisure control acts as a moderator between psychological detachment and proxies for recovery.

Third, our investigation was carried out in a unique setting of students in a dual study program at a private university where the students participate in full-time employment while enrolled in university coursework provided by block teaching. This setting might to be of high relevance since there are only few studies focusing on multiple role requirements in dual study programs and associated effects on students´ recovery. Moreover, there is a steady growth in numbers of students enrolled in such dual study programs and such settings might be prototypical for today´s constant increase in requirements for lifelong learning alongside gainful employment.

1.2 Job strain and the job demand control model (JDCM)

In his most prominent job strain model (JDCM), Karasek (1979) combined the two dimensions of job demands (work load stressors) and job control (decision latitudes), and argued (and provided first evidence) that jobs high on demands but low on control („high strain jobs“) bear the highest risks of illness and reduced well-being (in terms of exhaustion and depression). Later, Johnson and Hall (1988) found that increased job control buffers high job demands (= buffer hypothesis of JDCM) most effectively under conditions of high social support, resulting in an extended job demand control support model. Meanwhile, several reviews and meta-analyses supported JDCM with strong evidence for substantially increased risks of high strain jobs in terms of physical and mental illness like, e.g., coronary heart disease, depression, burnout, absenteeism (e.g., de Lange et al, 2003; Häusser et al., 2010; Karasek & Theorell, 1990;

Kivimäki et al., 2012; Luchman & Gonzáles-Morales, 2013; Stansfeld & Candy, 2006; van der Doef & Maes, 1999). Direct adverse effects of high job demand and low job control on health impairment could be largely confirmed even in longitudinal studies, whereas the buffer hypothesis of JDCM could only be demonstrated in a minority of studies, which was mainly attributed to problems in the operationalization of constructs (de Lange et al., 2003; Häusser et al., 2010).

While JDCM has been repeatedly used and established well as a means to explore job strain in the workplace, there are no studies specifically investigating if core assumptions of JDCM could be applied to the leisure domain as well and thus answer the question if JDCM might be conceptually extended to a more generalized job leisure demand control model. In particular, questions arise if (lack of) detachment from work, which might be framed as a leisure demand (precisely, a leisure stressor) and leisure control will – in analogy to the work domain – have direct as well as interactive effects on recovery at home.

1.3 Recovery from work and the stressor-detachment model

Any effort to understand the overall impact of job-related stressors on wellbeing and health need to include variables outside the work domain, in particular the process of recovery from work (Etzion et al., 1998). According to the effort-recovery model (Mejman & Mulder, 1998), adequate expenditure of effort to meet job demands by mobilizing energy resources is supported by decision latitudes at work. Under conditions of sufficient recovery, reversible strain reactions due to work load will return to a baseline level after a short time, whereas sustained work load and insufficient recovery will cause persistent, possibly irreversible negative effects, which may further lead to a loss of function, impairment or illness.

Drawing on the effort-recovery model (Meijman & Mulder, 1998) and conservation of resources theory (Hobfoll, 1989), Sonnentag and Fritz (2007) suggested four *components of recovery experiences* that are capable to restore and regain resources after work during leisure time: 1) *Psychological detachment* (Etzion et al., 1998) implies to disengage oneself mentally from work, to stop thinking about work and related problems. Comparable to the reversed concept of cognitive irritation (Mohr et al., 2005; Mohr et al., 2006), „the chances increase that demands on the functional systems taxed during work are reduced" (Sonnentag & Fritz, 2007, p. 206) by means of psychological detachment. 2) *Relaxation* (of body and mind) as a state of low activation and increased positive affect (Stone et al., 1995) might stop the process by which job stressors translate into illness. 3) *Control during leisure time* offers decision latitudes for self-determined choice which activities to pursue during leisure time. 4) *Mastery Experiences* subsume challenging activities with learning opportunities which might help to build up new psychological resources in terms of, e.g., self-efficacy and proficiency.

In the validation study of the recovery experiences questionnaire (Sonnentag & Fritz, 2007), all components were negatively related to indicators of health impairment (e.g., emotional exhaustion, depressive symptoms, health complaints). A narrative review (Sonnentag & Fritz, 2015) summarized the relationships between work stressors, the capacity to „switch off" (i.e., to detach psychologically), and well-being of employees as part of the SDM. This model builds on the assumption that high levels of work-related stress negatively influence one's capacity to detach from the workplace (Sonnentag, 2011; Sonnentag & Fritz, 2015). The ability to recover from work can in turn have profound impact on psychological and behavioral outcomes (Sonnentag & Geurts, 2009). Thus, psychological detachment is the critical feature in the recovery process, as it can interrupt exacerbation of exhaustion and facilitate the subsequent regeneration of resources. Numerous studies and several reviews have shown that psychological detachment from work is a recovery-related early indicator of consequences of job strain, predicted by high work demands, and a necessary functional link (mediator) between work stressors and health-relevant outcomes (Bennett et al., 2018; Cropley et al., 2012; Dettmers, 2017; Frone, 2015; Germeys & de Gieter, 2018; Geurts & Sonnentag, 2006; Kinnunen & Feldt, 2013; Sonnentag & Fritz, 2015; Sonnentag et al., 2017).

1.4 Disentangling components of recovery experiences and extending JDCM into the leisure domain

While the four recovery experience dimensions are often evaluated together (e.g., Kinnunen et al., 2011), they clearly assess different elements of the recovery process. Hence, in this section we will provide arguments for further disentangling the core components of recovery from work.

First, psychological detachment from work, as already explained by the SDM (Sonnentag & Fritz, 2015) and proven by numerous empirical findings with respect to its position as a mediator between work stressors and health-related indicators, is the psychological mechanism to interrupt spillover of job strain into the leisure domain. Thus, psychological detachment from work might be regarded as the *necessary but not sufficient* component in the process of recovery from work.

Second, relaxation serves as the best proxy among the proposed components of recovery experiences in terms of a state of *real* recovery. Relaxation often arises during non-demanding activities which rejuvenate body and mind, including, e.g., casual walking, yoga, or breath relaxation techniques (Sonnentag & Fritz, 2007). Another comparable and most suitable proxy for states of recovery is (quality of) sleep as a prolonged period of relaxation for body and mind to recover from daily efforts. In longitudinal studies, high strain jobs in terms of high job demands and low job control were prospectively associated with fatigue and sleep problems (de Lange et al., 2009; Hanson et al., 2011). Brosschot, Pieper and Thayer (2005) noted that persistent thoughts about work can impair sleep quality. Consequences of poor-quality sleep can in turn include fatigue and exhaustion, may lead to attention deficits, mistakes, slower pace of work, and negative affect (Pilcher & Huffcutt, 1996).

Third, mastery experiences were empirically related to neither job stressors (e.g., time pressure, overtime hours) nor job control (Sonnentag & Fritz, 2007). In comparison to psychological detachment, relaxation, and control over leisure time, which are supposed to protect against the „long arm of the job" (Meissner, 1971) in terms of a translation of job strain into the leisure domain, mastery experiences take a special role since they consume additional energy in order to gain new psychological resources. Thus, we would argue that mastery experiences are *not* at the core of recovery processes but rather beyond, as they help to build up new resources beyond a process of mere recovery from work by investing additional energy during leisure time. Moreover, in contrast to all other components which were negatively correlated with sleep problems, only mastery experiences were *not* correlated with sleep quality (Sonnentag & Fritz, 2007). From our point of view, this provides another argument that mastery experiences are *not mandatory* for recovery in terms of the restoration process of recovery which reduces or eliminates strain caused by work stressors.

Fourth, leisure control characterizes the extent to which individuals feel that they have a say in how their non-work time is used (Sonnentag et al., 2017). Decades ago researchers already argued that freedom in leisure is important for leisure functioning in adults and adolescents (Witt & Ellis, 1985). Leisure control has also been recognized as an important resource in the recovery process, as the ability to „control leisure time" offers employees the chance to choose their preferred activities in private life. If there is no opportunity to organize and experience leisure time, other recovery experiences may not take place. However, mere freedom of choice might not be sufficient to reach a state of real recovery, since this choice might result in strenuous or even exhausting activities like building a house or participating in a marathon race. Thus, comparable to job control in the work domain, leisure control in the private domain may also not be sufficient to avoid strain and exhaustion, but might be – e.g., according to a core assumption of JDCM – an important moderator of the stressor-strain relationship in the respective area of life.

1.5 Research question and hypotheses

Our study deals with a special occupational setting which has been rarely examined before. For university students in general, the ability to distinguish between work and private time represents a major challenge (Gumz et al., 2012) and students experience more stress than the general population (Herbst et al., 2016). In the case of a *dual study program* examined in this study, the absence of a clear separation between work, studies, and leisure time, combined with simultaneous obligations and work load from the workplace as well as the university, points to a potential high risk of job strain and a special importance of recovery experiences in leisure time to prevent health impairment. This importance was emphasized in a study by Merino-Tejedor et al. (2017), which validated the recovery experience questionnaire in a university context in Spain. Results of this study revealed positive relationships between recovery experiences with academic performance, academic satisfaction, and commitment in a cohort of students enrolled in a university program. The positive effects of recovery experiences on all aspects of academic study and daily life were also supported by results of a study by Safstrom and Hartig (2013), which documented a positive relationship between recovery experiences and life satisfaction as well as a negative association with stress among Swedish students. To our best knowledge there are no studies that investigated work stressors and recovery in the special setting of a dual study program with its competening obligations from two (work and study) domains.

Our main research question focuses on the relationships between work overload, core components of recovery from work, and the potential role of control in work and leisure domains. Based on assumptions of the SDM (Sonntentag & Fritz, 2015), extended by sleep as another suitable proxy of (prolonged) recovery, we suppose that

> *Hypothesis 1 (H1):* The relationship between work overload and recovery (in terms of a) relaxation and b) sleep quality) is mediated by psychological detachment from work.

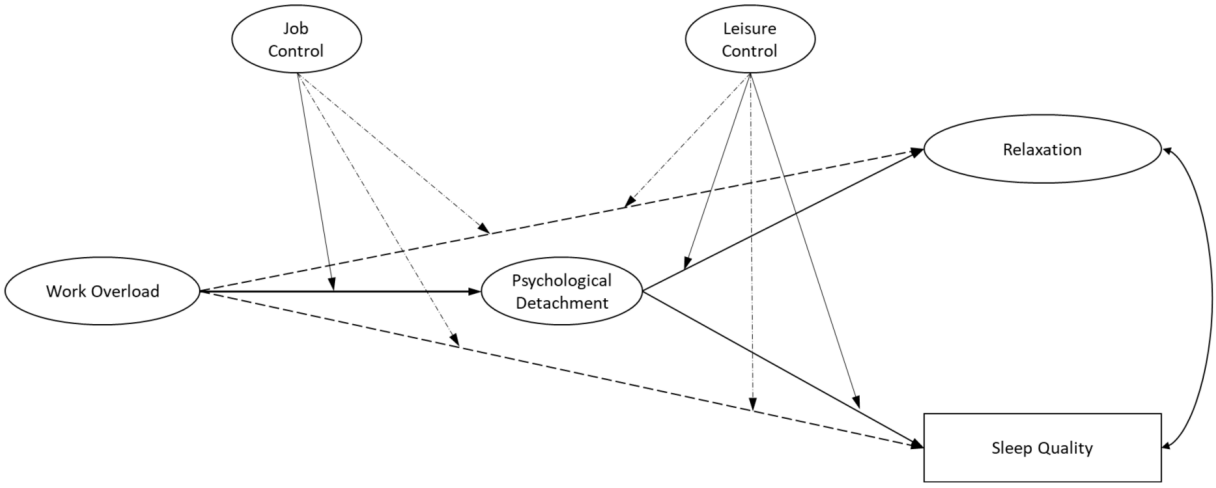

Figure 1: Conceptual Model.

Furthermore, according to core asumptions regarding high strain jobs and the buffer hypothesis of JDCM we suppose that

> *Hypothesis 2 (H2):* The relationship between work overload and psychological detachment from work is moderated by job control, in a way that job control reduces (buffers) the negative correlation between work overload and psychological detachment.

In the sense of an extension respectively, a generalization of these core assumptions of JDCM in terms of a buffer effect of control, and with (lack of) psychological detachment regarded as a demand (more precisely, a stressor) in the leisure domain, we suppose that

> *Hypothesis 3 (H3*): The relationship between psychological detachment from work and recovery (in terms of a) relaxation and b) sleep quality) is moderated by leisure control in a way that leisure control increases (boosts) the positive correlation between detachment from work and recovery.

In addition, we will explore potential interaction effects of job and leisure control on direct relationships between work overload and recovery. Our conceptual model (job leisure demand control model) is shown in Figure 1.

2 Methods

2.1 Design and sample

We conducted a cross-sectional survey of students enrolled in a dual study program. Data collection was carried out in February 2020 using a convenience sampling method. We distributed an online questionnaire that assessed selected job demands, job-related and personal resources, and personal recovery experiences. Three hundred and twenty-six participants were recruited by personal contact while enrolled at a private university. Answers to online questions were obtained as part of a complete survey provided to students in nine classes in a health-oriented bachelor's degree-granting program at five different locations at the university. Twenty-three questionnaires that had not been completed were excluded from the study. After adjusting for missing data, responses from 303 dual program students were available for analysis.

Most of participants were male (n = 222; 73.27 %). The average age was 21.44 years (standard deviation [SD] = 3.46 years) with a range of 18 to 44 years. Among the participants, 22.11 % reported that their workplace positions included managerial responsibilities. The time spent at work during an average week was 35.85 hours (SD = 4.52 hours) with a range of 21 to 60 hours (see Table 1).

2.2 Measures

The questionnaire was designed to assess core components of JDCM (work overload, job control), recovery experiences (detachment, control, and relaxation), and sleep quality. Unless otherwise indicated, the participants were asked to respond using a 5-point Likert scale from 1 = „not at all" to 5 = „to a very great extent". Each construct was measured with validated scales based on content validity and psychometric properties. Descriptive statistics are presented in Table 1.

Table 1: Means, standard deviations, Pearson zero-order correlations, and internal consistencies.

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
Control variables													
1	Sex (0 = male; 1 = female)			-									
2	Age (years)	21.44	3.46	-.12*	-								
3	Leadership position (0 = no; 1 = yes)			.07	.26**	-							
4	Effective working time (hours per week)	35.85	4.52	.09	.07	.19**	-						
Work characteristics													
5	Work overload	2.33	0.93	-.07	-.12*	.01	.12*	(.77)					
6	Autonomy	3.14	0.77	.10	.20**	.19**	.15*	-.30**	(.90)				
Resources & health-related behavior													
7	Psychological detachment	2.89	1.15	-.09	.07	-.06	-.11	-.30**	.01	(.90)			
8	Control during leisure time	3.97	0.97	.05	-.18**	-.12*	-.16**	-.32**	.13*	.39**	(.90)		
9	Relaxation	3.50	0.86	-.13*	-.13*	-.07	-.23**	-.22**	-.08	.43**	.53**	(.83)	
10	Sleep quality	2.68	0.80	-.05	.01	-.08	-.21**	-.26**	-.09	.34**	.31**	.40**	-

*Notes: N = 303; matrix diagonal (in parentheses): Cronbach's alpha; M = mean; SD = standard deviation. *p < .05, **p < .01.*

2.3 Job control and work overload

Core components of JDCM were measured with two scales from an established screening instrument for work analysis (Glaser et al., 2020). Job control subsumes 9 items which depict three different facets of autonomy at work in terms of execution control, goal control, and approach control (e.g., „I can determine for myself how to do my work"; α = .90). Work overload comprises 3 items focusing on overtaxing aspects of task quantity in relation to the given time (e.g., „I often have to hurry and still cannot complete my work"; α = .77).

2.4 Recovery experiences

Recovery experiences were measured using items of scales by Sonnentag and Fritz (2007) that reflect psychological detachment (3 items, e.g., „I forget about work"; α = .88), relaxation (4 items, e.g., „I kick back and relax"; α = .83), and leisure control (3 items, e.g., „I determine for myself how I will spend my time"; α = .90). Response options ranged from 1 = „strongly disagree" to 5 = „strongly agree". We adjusted the original scales by omitting the final item listed under psychological detachment and leisure control to facilitate modeling of latent interactions (cp. data analysis section).

2.5 Sleep quality

As a short indicator of sleep quality, we used a single item from the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). Participants responded to the question „During the past month, how would you rate your sleep quality overall?" using scores ranging from 1 = „very bad" to 4 = „very good". Hahn et al. (2011) examined the validity of this measure and reported that it correlated highly with the full PSQI.

2.6 Control variables

Participants reported their age (in years), gender (0 = male, 1 = female), effective working time (hours per week), and whether they were in a leadership position at work (0 = no, 1 = yes).

2.7 Data analysis

We performed confirmatory factor analysis (CFA) to test our measurement models and structural equation modeling (SEM) to test our hypotheses. We estimated the main effects of work overload on relaxation and sleep quality using the information provided in Model 1. In Model 2, psychological detachment was added as a mediating variable. In Models 3a and 3b, we tested latent interactions using the double-mean centering technique (Lin et al., 2010) and the matched-pairs strategy (Marsh et al., 2007): We first tested the hypothesized three interactive effects in Model 3a, complemented by an exploratory test of four additional interactions in Model 3b. The double-mean centering technique relies on the calculation of product indicators for latent interaction variables; this is achieved by matching pairs of the indicators of the latent variables involved in a given interaction. Pairwise matching requires an equal number of indicators associated with each variable (i.e., work overload, job control, psychological detachment, and leisure control). Because work overload was measured with fewer items (3) than was used to evaluate the moderating variables, we omitted one item from each of the latter categories. Second, for variables associated with job control, we created item parcels using the domain-representative approach (Little et al., 2002). This facilitated the reduction of 9 items to 3 parcels. Factors involved in moderation were identified by calculating simple slopes. In all models, the dependent variables were allowed to covary; this reflected the assumption that relaxation and sleep quality are interdependent aspects of the recovery experience even after considering the impact of work overload. To assess their impact on model fit and the hypothesized relationships, we also examined all models without covariates. We set the threshold for statistical significance (p) at .05, although we also point out results that approach statistical significance ($p < .10$). Model fit was assessed by established indices in combination with established rules of thumb for cut-offs (Hu & Bentler, 1999). In addition to the chi-square (χ^2) values and statistical significance, we also evaluated the root mean square error of approximation (RMSEA), where values that approach .06 indicate a good fit. We also inspected the 90% confidence interval of the RMSEA (CI_{RMSEA}) and a p-value for the test of the null hypothesis (i.e., that the RMSEA for the model does not exceed .05 for the overall population). We also evaluated our findings with the Comparative Fit Index (CFI) and Tucker-Lewis index (TLI), in which values close to .95 indicate a good fit. Finally, we examined the standardized root mean square residual (SRMR), in which values close to .08 indicate a good fit. Indirect effects were calculated as products of respective direct paths and tested for statistical significance via bootstrap confidence intervals based on 100,000 bootstrapped replicates. All analyses were carried out with Mplus 8.

3 Results

3.1 Preliminary analyses

We conducted CFAs to establish the distinctness of the latent constructs. For all three models, we allocated all items to their respective latent variables and allowed all factors to covary with one another. The single-item indicator for sleep quality was included as a manifest factor. The three-factor CFA Model 1 fit the data well, $\chi^2(18) = 44.54$, $p < .01$; CFI = .97; TLI = .95; RMSEA = .070; CI_{RMSEA} = [.044; .096], p = .10; SRMR = .050. Factor loadings ranged from .64 to .78. The four-factor CFA Model 2 also fit the data reasonably well, $\chi^2(39) = 102.80$, $p < .01$; CFI = .95; TLI = .94; RMSEA = .073; CI_{RMSEA} = [.056; .091], $p = .01$; SRMR = .050. Factor loadings ranged from .64 to .87. The eight-factor CFA Model 3a still showed acceptable fit, $\chi^2(203) = 504.55$, $p < .01$; CFI = .92; TLI = .90; RMSEA = .070; CI_{RMSEA} = [.062; .078], $p < .01$; SRMR = .058. The nine-factor CFA Model 3b (including all latent interactive effects for exploratory purposes) showed a somewhat weaker fit, $\chi^2(264) = 706.96$, $p < .01$; CFI = .90; TLI = .87; RMSEA = .074; CI_{RMSEA} = [.068; .081], $p < .01$; SRMR = .060. Factor loadings of both Models 3a and 3b ranged from .47 to .93, with low factor loadings observed for some product indicators of moderation. Because the loadings might have a negative impact on model fit, we experimented with other available approaches, including the all-possible-pairs strategy (Marsh et al., 2007), the internal-consistency approach to item parceling (Little et al., 2002), or selection of items rather than parceling; these strategies yielded no improvements in model fit or factor loading. As a consequence, we opted to retain the original model for further analysis, although we advise caution when interpreting findings pertaining to moderation.

Descriptive statistics and correlations among the study variables are shown in Table 1. Work overload was negatively associated with job control ($r = -.30$, $p < .01$), psychological detachment ($r = -.30$, $p < .01$), leisure control ($r = -.32$, $p < .01$), relaxation ($r = -.22$, $p < .01$), and sleep quality ($r = -.26$, $p < .01$). Job control was only minimally positively associated with leisure control ($r = .13$, $p < .05$). Psychological detachment was highly positively associated with leisure control ($r = .39$, $p < .01$), relaxation ($r = .43$, $p < .01$), and sleep quality ($r = .34$, $p < .01$). Leisure control was also highly associated with relaxation ($r = .53$, p < .01) and moderately associated with sleep quality ($r = .31$,

$p < .01$). Sleep quality was positively associated with relaxation ($r = .40$, $p < .01$). We also note that female participants were slightly, but significantly younger than their male counterparts ($r = -.12$, $p < .05$) and reported slightly lower levels of relaxation ($r = -.13$, $p = .02$). Age was positively associated with leadership positions ($r = .26$, $p < .01$) and job control ($r = .20$, $p < .01$), and negatively associated with work overload ($r = -.12$, $p < .05$), leisure control ($r = -.18$, $p < .01$), and relaxation ($r = -.13$, $p < .05$). Leadership positions were positively associated with effective working time ($r = .19$, $p < .01$) and job control ($r = .19$, $p < .01$), and negatively to leisure control ($r = -.12$, $p < .05$). Effective working time was minimally positively associated with work overload ($r = .12$, $p < .05$) and job control ($r = .15$, $p < .05$), and negatively associated with leisure control ($r = -.16$, $p < .01$), relaxation ($r = -.23$, $p < .01$), and sleep quality ($r = -.21$, $p < .01$).

3.2 Direct and indirect effects of work overload and psychological detachment

Following the CFA, we performed SEM to test our hypotheses. The SEM Model 1 without covariates resulted in a good fit that was identical to that obtained for the CFA Model 1 (see above) because of an almost identical model specification with the same degrees of freedom. The only differences between these models were the use of correlations *vs*. directed paths to connect work overload and the various outcomes. Adding the covariates reduced model fit, $\chi^2(67) = 98.89$, $p < .01$; CFI = .93; TLI = .89; RMSEA = .073; CI_{RMSEA} = [.055; .090], $p = .02$; SRMR = .047. Because SEM Model 1 was identical to the SEM Model 2 except for the exclusion of psychological detachment in the former, only Model 2 is depicted (Figure 2). The SEM Model 2 without covariates showed good fit, $\chi^2(39) = 102.80$, $p < .01$; CFI = .95; TLI = .94; RMSEA = .073; CI_{RMSEA} = [.056; .091], $p = .01$; SRMR = .050. Similar to our findings with SEM Model 1, addition of covariates resulted in a reduced fit, $\chi^2(67) = 168.07$, $p < .01$; CFI = .93; TLI = .90; RMSEA = .071; CI_{RMSEA} = [.057; .084], $p = .01$; SRMR = .045. Covariates had negligible impact (no more than .10) on the hypothesized paths (Becker et al., 2016). Nevertheless, we retained the covariates within these models because some exhibited interesting effects.

Joint consideration of Models 1 and 2 facilitated our investigation of the association of work overload with relaxation and sleep quality both with and without controlling for psychological detachment. In terms of a mediation framework, total effects were examined in Model 1, while direct and indirect effects were examined in Model 2. Model 1 (not shown) revealed that, in absence of psychological detachment, work overload was negatively associated with both relaxation ($\beta = -.25$, $p < .01$) and sleep quality ($\beta = -.28$, $p < .01$). Higher age ($\beta = -.21$, $p < .01$), female vs. male gender ($\beta = -.16$, $p < .01$), and higher working time ($\beta = -.24$, $p < .01$) related to less relaxation. Higher working time was also associated with diminished sleep quality ($\beta = -.16$, $p < .01$). Inclusion of psychological detachment as an additional predictor of both outcomes in Model 2 (Figure 2) rendered the direct effect of work overload on relaxation statistically insignificant ($\beta = -.08$, $p = .22$) but not the direct effect on sleep quality ($\beta = -.18$, $p < .01$). This suggests that psychological detachment may be a full or a partial mediator of the overall impact of work overload on relaxation and sleep quality, respectively. To investigate this further, we established a statistically significant effect of work overload on psychological detachment ($\beta = -.36$, $p < .01$). Psychological detachment, in turn, was positively associated with both relaxation ($\beta = .47$, $p < .01$) and sleep quality ($\beta = .27$, $p < .01$). Mediation analysis confirmed that the effect of work overload on relaxation was fully mediated by psychological detachment ($\beta = -.17$, 95 % bootstrapping CI [-.25, -.09]). Likewise, we found that psychological detachment was a partial mediator of the effects of work overload on sleep quality ($\beta = -.10$, 95 % bootstrapping CI

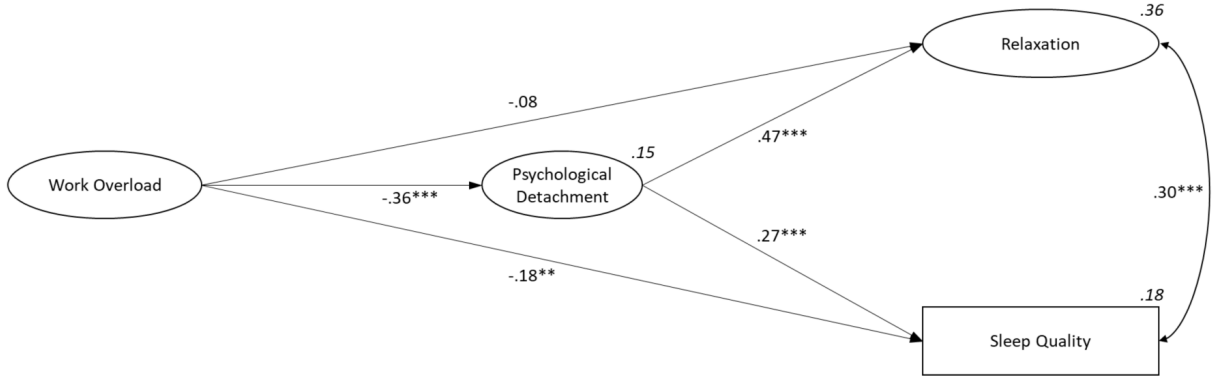

Figure 2: Mediation Model 2.

*Notes: * $p < .05$, ** $p < .01$. For sake of clarity, control variables have been omitted from this figure.*

Table 2: Standardized coefficients, standard errors and p values of moderation models 3a and 3b.

	Model 3a			Model 3b		
	β	*SE*	*p*	*β*	*SE*	*p*
Outcome: Psychological detachment						
Work overload	-.46	.07	<.01	-.46	.07	<.01
Job control	-.15	.06	.02	-.15	.07	.02
Work overload x Job control	.14	.06	.03	.14	.06	.02
Age	.06	.06	.35	.06	.06	.35
Gender	-.12	.06	.04	-.12	.06	.04
Working time	.00	.06	.98	.00	.06	.98
Leadership position	-.02	.06	.73	-.02	.06	.73
Outcome: Relaxation						
Work overload	.02	.08	.78	.03	.08	.68
Psychological detachment	.27	.06	<.01	.30	.06	<.01
Job control	-.12	.06	.05	-.12	.06	.04
Leisure control	.61	.06	<.01	.57	.06	<.01
Work overload x Job control				-.14	.06	.02
Work overload x Leisure control				.11	.08	.16
Psy. detachment x Leisure control	.11	.06	.06	.12	.08	.11
Age	-.08	.06	.14	-.10	.06	.06
Gender	-.12	.05	.02	-.11	.05	.04
Working time	-.17	.05	<.01	-.20	.05	<.01
Leadership position	.09	.05	.09	.07	.05	.18
Outcome: Sleep quality						
Work overload	-.21	.09	.01	-.18	.09	.04
Psychological detachment	.18	.06	.01	.20	.06	<.01
Job control	-.20	.06	<.01	-.20	.06	<.01
Leisure control	.19	.07	.01	.16	.07	.02
Work overload x Job control				-.13	.06	.03
Work overload x Leisure control				.19	.08	.02
Psy. detachment x Leisure control	.02	.06	.77	.09	.08	.27
Age	.04	.06	.52	.02	.06	.75
Gender	-.03	.05	.63	-.01	.05	.90
Working time	-.10	.06	.07	-.14	.06	.01
Leadership position	.01	.06	.82	-.02	.06	.77

Notes: N = 303.

[-.16, -.04]). Thus, H1 was supported by the data. Regarding covariates in Model 2, we found that higher age (β = -.22, p < .01) and higher working time (β = -.21, p < .01) related to less relaxation. Higher working time was associated with diminished sleep quality (β = -.14, p = .01). Explained variance in Model 2 was 15 % for psychological detachment, 36 % for relaxation, and 18 % for sleep quality, compared to 18 % for relaxation and 12 % for sleep quality in Model 1.

3.3 Moderating effects of job control and leisure control

The moderating effects associated with job control and leisure control were tested in SEM Models 3a and 3b. Model 3a without covariates approached acceptable fit, $\chi^2(207) = 557.35$, p < .01; CFI = .91; TLI = .89; RMSEA = .075; CI_{RMSEA} = [.067; .082], p < .01; SRMR = .074. Inclusion of the covariates slightly reduced model fit, $\chi^2(252) = 658.49$, p < .01; CFI = .90; TLI = .87; RMSEA = .073; CI_{RMSEA} = [.066; .080], p < .01; SRMR = .068. Mirroring the findings for CFA Model 3b, the corresponding SEM Models 3a and 3b exhibited some weaknesses regarding model fit, $\chi^2(267) = 757.54$, p < .01; CFI = .89; TLI = .86; RMSEA = .078; CI_{RMSEA} = [.071; .084], p < .01; SRMR = .073. Consistent with the results considered above, adding covariates reduced the model fit even further, $\chi^2(335) = 907.01$, p < .01; CFI = .87; TLI = .84; RMSEA = .075; CI_{RMSEA} = [.069; .081], p < .01; SRMR = .067. As above, the covariates had a negligible impact (no more than .10) on the hypothesized paths (Becker et al., 2016). However, we opted to maintain the models with covariates due to the meaningful information contained in the main effects of some covariates.

In Model 3a, the effect of work overload on psychological detachment (β = -.46, p < .01) was moderated by job control (β = .14, p = .03). Simple slopes analysis confirmed the buffering effect of job control assumed in H2, with higher levels of control relating to a less negative association of work overload and detachment. Neither effect of psychological detachment on relaxation (β = .27, p < .01) or sleep quality (β = .18, p < .01) was moderated by leisure control (relaxation: β = .11, p = .06; sleep quality: β = .02, p = .77), disconfirming H3. Because the moderation effect of leisure control on the link between psychological detachment and relaxation approached statistical significance (p = .06), we investigated simple slopes, revealing signs of the assumed booster effect of higher levels of leisure control relating to a stronger positive association between psychological detachment and relaxation. Regarding covariates in Model 3a, we found that higher working time related to less relaxation (β = -.17, p < .01) and female vs. male gender related to both less psychological detachment (β = -.12, p = .04) and less relaxation (β = -.12, p = .02).

The moderating effects in Model 3a did not change substantially in Model 3b. Exploring the additional interactive effects in this model, we found the impact of work overload on relaxation (β = .03, p = .68) to be moderated by job control (β = -.14, p = .02). However, contrary to the assumed buffering role, we observed an amplifying effect, as low levels of job control were associated with a positive effect from work overload on relaxation, whereas higher levels of job control weakened this effect, failing to reach statistical significance. Likewise, the effect of work overload on sleep quality (β = -.18, p = .04) was also moderated by job control (β = -.13, p = .03) in an unexpected way, exerting an amplifying effect (i.e., higher levels of job control strengthened the negative impact of work overload on sleep quality.) Finally, the effect of work overload on sleep quality (β = -.18, p = .04) was moderated by leisure control (β = .19, p = .02), such that higher levels of leisure control weakened the negative effect from work overload on sleep quality. None of the remaining moderating effects achieved statistical significance (Table 2). Regarding covariates in Model 3b, we found that female vs. male gender related to less psychological detachment (β = -.12, p = .04) and less relaxation (β = -.11, p = .04). Furthermore, higher working time was associated with less relaxation (β = -.20, p < .01) and diminished sleep quality (β = -.14, p = .01). Explained variance was 23 % / 24 % for psychological detachment, 53 % / 55 % for relaxation, and 22 % / 25 % for sleep quality in Models 3a / 3b, respectively.

4 Discussion

Against the backdrop of continuously advancing changes in the world of work in terms of work intensification and work extensification (Kubicek & Tement, 2016; Richardson, 2017), accompanied by blurring boundaries between work and private life domains (Gumz et al., 2012; Stansfeld & Candy, 2006), resulting in increasing rates of physical and mental health impairment of employees (Sonnentag & Fritz, 2015), our study provides added value in two respects. *First* and from a theoretical perspective, we proposed to extend core assumptions of the most prominent job stress model – the JDCM by Karasek (1979) – from the work domain into the private domain. Moreover, and following this proposition, we tried to disentangle the dimensions of recovery experiences (Sonnentag & Fritz, 2007) by arguing that psychological detachment is a necessary but not sufficient precondition for recovery that mediates effects of work overload (as a most important job stressor in modern work) on *real*

states of recovery experiences in terms of relaxation and sleep quality. This assumption is in line and based upon the SDM by Sonnentag and Fritz (2015). Following core assumptions of JDCM, we argued that perceived control has a buffering effect in the work *as well as* in the leisure domain, proposing our multi-moderated mediation model, which might be called the „job leisure demand control model". *Second*, we examined a neglected setting in occupational stress research – students in a dual study program. Besides high risks for lack of recovery and health impairment of students in general, students in dual study programs seem to be quite prototypical for modern work since they have to face and manage not only one but two demanding domains of work (in the company and at the university). In essence, students in dual study programs face the demand of continuous vocational learning combined with high challenges to balance different work and life domains in a rather self-regulated way without collective voice or power.

Results of our cross-sectional study with 303 participants enrolled in a dual study program at a private university revealed mediating effects of psychological detachment from work in the transmission process between perceived work overload on states of recovery. For the more proximal recovery state of relaxation in the leisure domain, we found full mediation, and for the rather distal state of sleep quality, we found partial mediation of the negative effects of work overload via psychological detachment. These results confirm our H1 and add more evidence to the established SDM in an under-researched occupational setting (Sonnentag & Fritz, 2015).

Regarding the core assumptions of the JDCM, our results showed a negative direct effect of work overload on psychological detachment as well as a moderating (buffering) effect of job control on this effect, confirming our H2. With respect to our proposition to generalize the assumptions of the JDCM into the leisure domain, we also found a positive direct effect of psychological detachment on both relaxation and sleep quality but we did not find moderating effects of leisure control on neither of these relationships, disconfirming H3. While there was a tendency ($\beta = .11$, $p = .06$) for the expected a booster effect of leisure control on the relationship between psychological detachment and the more proximal state of recovery (relaxation), no moderating effect of leisure control could be found for the relationship between psychological detachment and the more distal state of recovery (sleep quality). This unexpected non-finding might be attributed to the character of perceived leisure control as an important resource in the non-work domain, which is not a sufficient condition for relaxation nevertheless. Leisure control does not necessarily imply that relaxation (as our proximal indicator of recovery) is realized. Usually, the term leisure is assigned with positive connotations such as „me time", relaxation, freedom from constraints or pressure. However, this leisure or non-work time might also be stressful or uncomfortable. Leisure time in the non-work domain is increasingly supposed to be filled with meaning, expression, or a sense of belonging, and thus, filled with other kinds of obligations or activities beyond relaxation or recovery, which makes the onset of mental and physical relaxation significantly more difficult (van Heck & Vingerhoets, 2007).

Our more distal recovery indicator, sleep quality, might be affected by additional predictors not examined in this study. Two reviews of longitudinal studies show sleep to be positively affected by job control and social support, among others (Linton et al., 2015; van Laethem et al., 2013). High work demands and stress, as well as an imbalance between work-related effort and reward (effort-reward imbalance), lead to non-restorative sleep (Linton et al., 2015; van Laethem et al., 2013). Sleep itself is a complex process. Several factors can contribute to reduced sleep quality, including physical and psychosocial impairments. Physical discomfort and medication side effects are potential factors that can reduce sleep quality (Chung & Cheung, 2008). Healthy sleep routines and physical activity in leisure time have positive influences. Evening light, use of electronic devices such as mobile phones, computers, and video games are potential factors that delay bedtime, contributing to poor sleep. Other factors that may have a negative impact on sleep quality include caffeine consumption, tobacco use and poor home environments, such as evening light and room temperature (Bartel et al., 2015). Wang and Biro (2021) classified various determinants of sleep quality among college students into four domains: lifestyle determinants, determinants related to mental health, social determinants, and physical determinants. Results of their review indicated that lifestyle factors were the most frequently investigated domain in sleep quality research, followed by mental health and social and physical factors. Moreover, sleep quality can be influenced by further extra-occupational demands and resources (Crain et al., 2018; Reis & Prestele, 2020). Future research should consider such determinants for recovery in the non-work domain.

Beyond our hypotheses, we also explored other plausible interaction effects of job and leisure control in the leisure domain. A key finding here was that the negative effect of work overload on sleep quality (but not on relaxation) was buffered by leisure control. Thus, while the assumed moderating effects *within* the leisure domain (cp. H3) could not be found, this result shows that leisure control bears significance at least for spillover processes *between* the work and the leisure domain (in this case, effects of work overload

on sleep quality). This suggests that the JDCM core assumption of a moderating effect of control may at least partially be generalized into the leisure domain.

Ostensibly unexpected, these results revealed negative effects of job control on the relationships of work overload with both states of recovery, which indicates an augmentation of the direct negative effects of work overload on relaxation and on sleep quality. According to the results, a detrimental spill-over of work overload into the private domain might be increased by higher levels of job control. The literature on subjectification of work and the entreployee concept (Höge, 2019; Pongratz & Voß, 2003) suggests an explanation for such a paradoxical effect of job control if it is associated with higher levels of responsibility for work outcomes, self-responsibility, self-economization, and self-exploitation through indirect control (Peters, 2011). According to Peters (2011), indirect control involves working with targets such as key performance indicators. Employees are given goals and framework conditions but are supposed to figure out for themselves how to achieve their goals. Problems may arise when companies also set too high and difficult-to-achieve goals for their employees, and when there are negative consequences for them if they do not achieve their goals. Under such conditions, higher job control may go hand in hand with higher levels of stressors induced through indirect control, with negative effects of the latter outweighing positive effects of the former. Following this reasoning, the unexpected effects of job control may be attributed to unmeasured third variables acting as stressors and accounting for the detrimental effects. Future research should aim to explicitly measure such third variables that may be characterized as decision necessities, complicatedness (Frese & Zapf, 1994), or option load (Pfaff et al., 2010).

The focus of our study was placed on the important resource „control". Future studies should focus attention on additional resources such as social support in work and in private life. In particular, resources such as social support from students and teachers (Gusy et al., 2016) should be included – in dual-study students, social support by colleagues and by supervisors might also be important resources (Sonnentag & Fritz, 2015; Jolly et al., 2021; Steed et al., 2021). The consideration of possible stressors was limited to work overload. Future investigations should include other established work stressors such as role conflicts, information problems, work interruptions (Sonnentag, 2015; Sonnentag, 2018; Heuse et al., 2020) or stressors in the private sector such as overload with additional family obligations, for example in the context of reproductive work, especially with women (Voydanoff, 2004; Hegewisch & Gornick, 2011; Nordenmark, 2021). Regarding students, it would be helpful to include further requirements such as excessive demands during studies as well as the compatibility of study and private life (Gusy et al., 2016).

4.1 Limitations

Our study has several limitations that should be considered in the interpretation of results. First, the cross-sectional nature of the study does not enable predictions over time and forbids the determination of causation. It is well known that cross-sectional data may introduce significant biases into the estimation of mediation (Taris & Kompier, 2006). Future research should embrace longitudinal study designs and interventions that aim at increasing control and/or psychological detachment. Forthcoming research might also look at the connections as a reverse process and consider relationships that reciprocally link work overload with psychological detachment, relaxation, and sleep quality. Second, our results are primarily based on self-reported data collected at the individual level. As such, we cannot rule out the possibility that correlations were inflated by common-method bias (Podsakoff et al., 2011). Third, because we kept item wordings and item order of the scales exactly as they were reported in respective validation studies, we cannot rule out item order bias (Weinberg et al., 2018). Fourth, the participants were first semester students in a single bachelor's degree program. The data were collected from a homogenous sample of predominantly male participants. These participants represented a convenience sample and were not representative of the population. Our results might change if we included a more diverse group of students during subsequent semesters and from other degree programs. A further aspect to be considered is that the sample consists of students of a health-oriented degree program with potential effects, e.g., in terms of more favorable conditions (e.g., health-awareness, health-competence), which could be significantly worse in other dual study programs. On the other hand, because the participants in this study had to fulfill an additional work role (of studying) beside their salaried job, they may be subject to a form of self-justification bias. In an effort to maintain commitment to their decision of engaging in a dual-strain situation, participants might downplay experienced strain and emphasize positive aspects of their situation instead, which could possibly result in an attenuation of effects. Further evaluation of the properties of sleep (e.g., sleep duration, sleep latency, daytime dysfunction), external feedback, study achievements, and / or work assessments might also be considered. Finally, research on the capacity for psychological detachment from work would benefit from studies that assess objective and multi-source

data. It would be advisable to complement the self-reported data with objective measurement methods such as qualitative sleep parameters (time in bed, sleep efficacy index) or the use of sleep tracking apps. Future studies might also want to use more differentiated consideration of student-specific stressors as well as leisure time challenges.

4.2 Practical implications

Psychological detachment represents a substantial nexus between work-associated factors and the consequences of job-stress that serve as early indicators of work-related impairment. Earlier research studies have focused on psychological detachment from work as an important variable associated with the recovery process. Our findings reveal some practical implications for this goal. Based on the JDCM, our results confirm the relevance of job control which is a decisive component for being able to detach and thus also a precondition for being recovered. Although we did not find buffer effects of leisure control within the leisure domain (i.e., between psychological detachment from and both states of recovery), we found leisure control to moderate effects in the spillover process from the private to the leisure domain (i.e., between work overload and sleep quality). We need to develop a better understanding of how job control and leisure control serve to shape the recovery process. Stressors associated with specific jobs and dual study programs, combined with a lack of adequate focus on recovery, can ultimately undermine individual health and health-related behavior. Findings might inspire the development and evaluation of interventions that promote psychological detachment, relaxation, and improved sleep quality. Specific consideration might be given to recovery experiences of students enrolled in dual study programs, who are involved in multiple requirements at work as well as in university. Our findings suggest that students might be encouraged to detach from work during off-times, particularly when job and academic requirements are both high.

5 Conclusion

In our study, we identified psychological detachment to fully mediate the impact of work overload on relaxation and to partially mediate its impact on sleep quality for students in a dual study program. Moreover, we found that job control buffered the negative association between work overload and psychological detachment, and that leisure control buffered the negative association between work overload and sleep quality. While these findings suggest partial generalizability of core assumptions of the JDCM into the leisure domain, finding explanations for unexpected findings and non-findings remains to be addressed by future research. Our results suggest that relationships between psychological detachment from work and recovery experiences in terms of relaxation and sleep quality are influenced by additional factors beyond leisure control, and that job control might have certain unintended negative consequences for recovery experiences in the non-work domain.

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