



**Predictors of Work Pressure and Work Stress: The
Moderating Role of Hindrance and Challenge Appraisals of
Job Demands**

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Abstract

Due to high work pressure among academic personnel and its consequence of higher work stress, it is crucial to gain an understanding on the possible predictors of work pressure. This study aims to contribute to the job demands literature by researching the relation of workload and task multiplicity to work pressure and work stress. Additionally, in this study the moderating role of hindrance and challenge appraisal on the relationship between job demands and work stress based on the hindrance and challenge framework by Lazarus (1999) and the job demands resource model by Demerouti et al. (2001) is investigated. Using a cross-sectional design, a survey research resulted in data from 159 academic personnel of the Psychology Department of the University of Amsterdam. The results indicated that workload and task multiplicity were positively related to work stress, regardless of whether hindrance or challenge appraisal was high or low. Additionally, these relationships were fully mediated by work pressure. When there was a low experienced workload, a high challenge appraisal was related to lower work pressure compared to a low challenge appraisal. Direct relationships of hindrance and challenge appraisal were found significant in such a way that hindrance appraisal was positively related to work pressure and work stress and challenge appraisal was negatively related to work pressure and work stress. An exploratory analysis indicated that the mediated moderation model was significant for educational workload but not for research-related and administrative workload. These results imply the importance of lowering workload and task multiplicity to decrease work pressure and work stress in addition to lowering the hinderance appraisal and promoting the challenge appraisal of job demands.

Keywords: work stress, work pressure, job demands, workload, task multiplicity, hindrance and challenge appraisal.

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Introduction

The times are changing fast, and employees are asked to quickly adjust to the challenging dynamics of the work environment. This is not any different for university employees. The growing number of students registrations each year increases the work pressure of university employees to preserve the quality of the education (NOS, 2021; UvA, 2021). Research indicated that seventy per cent of Dutch university employees experience high work pressure (Heerekop, 2019). This finding resulted in critical questions from the Dutch parliament to the minister (Van Engelshoven, 2019) because when work pressure is continuously high, it decreases physical and psychological well-being (Pluta & Rudawska, 2020; Alarcon, 2011), which causes problems for both the employee and the organization.

In consultation with directors of education of multiple universities in the Netherlands and the academic unions, all universities were asked to create a plan of operation to decrease their employees' work pressure (Inspectie SZW, 2021). The Inspection of the Ministry of Social Affairs and Employment (Inspectie SZW) concluded that these plans were insufficient to solve the problem of work pressure in the long term as they did not focus on changing the cause. Additionally, universities indicated that not enough funding was the most important cause of work pressure. Aspects that the universities could influence were described by the universities as less relevant (Inspectie SZW, 2021). However, it is still important to identify the causes of work pressure and work stress that can be influenced by the universities to alleviate the work pressure and work stress of the employees.

Previous empirical studies show that job demands, such as low control, negative social interactions with colleagues, task multiplicity, and a lack of support, as well as work pressure and work overload, lead to a decrease in employee well-being, including higher work stress (Hirschle & Gondim, 2020; Alarcon, 2011; Crafword et al., 2010; Tadic et al., 2014; Roe & Zijlstra, 2000). However, Hofmans et al. (2015) showed in their research that certain demands

such as workload do not necessarily negatively affect well-being. This can be explained by the distinction in challenge and hindrance appraisal. When a job demand is appraised as a challenge, it is seen as an aspect of the job that promotes development and is motivating. In contrast, when a job demand is appraised as a hindrance (or frustration), it is seen as an aspect of the job that can potentially harm growth (LePine et al., 2005; Searle & Auton, 2014). Prior research has often categorized the appraisal of specific demands as either a challenge or a hindrance (e.g., Downes et al., 2021; Tadic et al., 2015; Cavanaugh et al., 2000). However, this method prevents measuring subjective experiences and appraisals of job demands. Job demands can be appraised differently by different people (Searle & Auton, 2014). Where one person can appraise workload as a hinder, another can see it as a challenge. Therefore, we propose that it is essential to investigate whether job demands lead to work stress depending on whether an individual appraises workload as a challenge or hindrance. Two important job demands to consider among university employees are workload and task multiplicity. The increase of students which is not accompanied with more teachers increases the workload for most academic personnel (Van Engelshoven, 2019). Additionally, almost all of the academic personnel have both educational and research-related tasks. Due to these various tasks, also called task multiplicity (Roe & Zijlstra, 2000), employees have to switch between tasks and have to be able to prioritize which of the tasks is most important. Thus, we propose that in addition to workload, task multiplicity is likely to be related to work pressure and indirectly work stress.

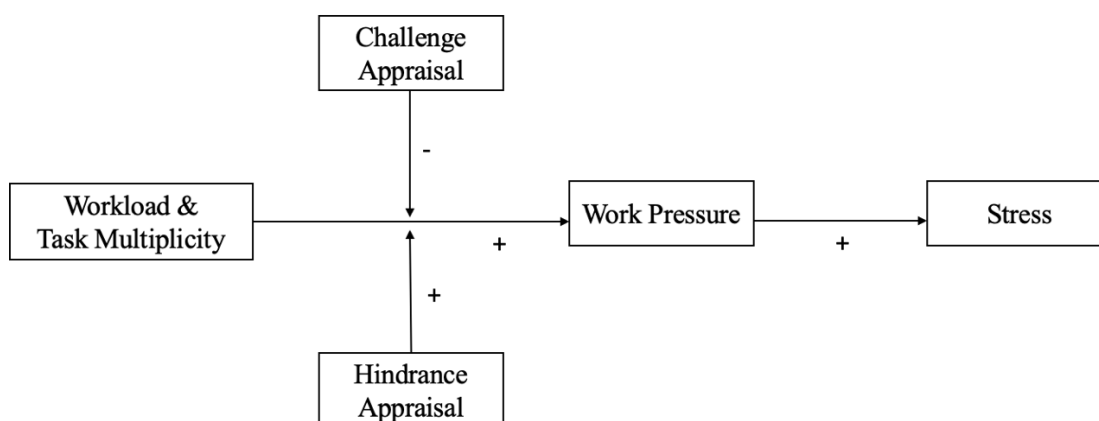
How job demands are appraised is suggested to differ between sectors (Bakker & Sanz-Vergel, 2013). Where one job demand can be appraised as a challenge in one sector, it can be appraised as a hinder in another sector. In addition, there can also be differences between task types within sectors. Close to no research has been conducted to investigate the differences between task types in relation to work pressure and work stress. Due to the increase of

students, academic teachers have more administrative tasks besides their usual education and research tasks (Van Engelshoven, 2019). Thus, it is crucial to investigate how different demands and different task types are appraised and how this affects whether it will lead to work pressure and work stress.

In this study, two research questions will be answered. First, the focus will be on how the appraisal of job demands as a hindrance or challenge affects the relationship between job demands and work stress and if this relationship is mediated by work pressure. Two job demands will be studied: workload and task multiplicity. This research question is visualized in a conceptual model (see Figure 1). Second, we will conduct an exploratory analysis to answer the question if the appraisal of job demands and their relationship with work pressure and work stress, as depicted in Figure 1, is different for educational, research-related, and administrative tasks. In this research, data was collected from a sample from academic personnel from the University of Amsterdam to investigate work pressure in a sector where previously is found that employees are affected by high work pressure. In this study, we aim to give a practical contribution on how to decrease work pressure and work stress among academic personnel. Additionally, theoretically we aim to specify how self-appraised job demands relates to work pressure and work stress.

Figure 1

Conceptual Model



Theoretical Background

Work pressure is a crucial problem in the academic sector (Heerekop, 2019), but it is not always clear what is meant by it. In university policy work pressure is described as the amount of work to be finished in a certain time frame (UvA, 2017). However, some authors have used a similar definition for workload (Pluta & Rudawska, 2020; Bateman, 1981). Different from workload, Pluta and Rudawska (2020) describe work overload as too much work with too little resources to cope. Roe and Zijlstra (2000) provide a clear distinction. They describe *workload* as the amount and pace of work, *work pressure* as the strain when there are not enough resources to cope with job demands (similar to work overload), and *work stress* as an affective state of worry and anxiety caused by work. Because of the clear distinction between the three constructs, we use the definitions used by Roe and Zijlstra (2000).

In their research on workload, work pressure and work stress, Roe and Zijlstra (2000) found evidence that high job demands and low resources lead to work pressure which in turn leads to exhaustion and fatigue (Roe & Zijlstra, 2000). The Job Demands-Resources model explains the effects of high job demands and low resources. Job demands are physical, social, or organizational aspects of someone's job "that require sustained physical or mental effort" (Demerouti et al., 2001, p. 501). High job demands lead to employee exhaustion (Demerouti et al., 2001; Bakker et al., 2004), which can be associated with work stress. Resources are the physical, social, or organizational aspects of someone's job that can help someone cope with job demands by achieving goals, reduce the psychological costs of demands, and motivating personal growth (Demerouti et al., 2001). In a diary study Tadic et al. (2015) showed that job demands can lead to higher well-being at work when there are enough resources to cope with the demands.

Work Pressure and Work Stress

Hirshle and Gondim (2020) mention in their literature review that work pressure can lead to a decrease in employee well-being at work as well as in overall health. In a meta-analysis, LePine et al. (2005) showed that when individuals experience a prolonged period of work pressure this has a negative effect on their well-being. Similar results were found in an empirical study by Pluta and Rudawska (2021), who showed that employees with high work pressure are more likely to have a burn-out, an outcome of prolonged work stress.

Some studies directly investigated the relationship between work pressure and work stress. For example, in research among firefighters, a sector where there is a shortage on resources to cope with job demands, work pressure was related to higher work stress (Smith et al., 2017). Because there are increasing demands and not enough resources in the academic sector (UvA, 2017; Heerekop, 2019), we expect similar results such that work pressure has a negative relationship with work stress.

H1: Work pressure has a negative relationship with work stress among university employees.

The Appraisal Theory – Challenge and Hindrance Framework

The Job Demands-Resources model explains that high job demands and low resources lead to lower well-being at work (Demoutri et al., 2001; Bakker et al., 2004). However, other research has found that not all job demands necessarily have negative outcomes (Hofmans et al., 2015; LePine et al., 2005). This difference can be explained with the challenge-hindrance framework by Lazarus (1999).

Lazarus (1999) explains that people appraise situations in their life to be either harmful, threatening or challenging to their goal attainment. The appraisal process consists of two appraisal moments. Within the first appraisal, individuals evaluate if a certain situation is relevant to their goals. Within the second appraisal, which occurs when the situation is being

appraised as relevant, individuals appraise if their resources are enough to cope with the situation (Lazarus, 1999). When the resources are high enough to cope with the situation, individuals are likely to appraise the situation as a challenge rather than a hinder. When a demand or situation at work is appraised as a challenge, it was found to have a motivational and engaging effect on individuals (LePine et al., 2005; Lazarus, 1999) because it brings people closer to their goal instead of harming their progress. Frustration or hinder is not initially mentioned in the appraisal theory. However, Searle and Auton (2014) state and show within their research that hindrance can be described as an appraisal. When a demand is appraised as a hinder it can harm growth and development, because it hinders people in reaching their goals.

The challenge-hindrance framework is supported in various empirical studies. In a sample of managers, challenge demands were positively related to job satisfaction, and negatively to job search and voluntary turnover, while hindrance demands were negatively related to job satisfaction and positively to job search and voluntary turnover (Cavanaugh et al., 2000). In a correlational study among students LePine et al. (2004) found that hindrance stressors were positively related to exhaustion and negatively to the motivation to learn. LePine et al. (2005) showed in a meta-analysis that hindrance stressors negatively and challenge stressors positively related to performance. A diary study by Tadic et al. (2015) showed that high job demands could lead to higher well-being when the demands were appraised as a challenge rather than a hinder. Another meta-analysis by Downes et al. (2021) showed that hindrance demands had positive relationship with strain and a negative relationship with engagement, while challenge demands had a positive relationship with engagement.

Although the distinction between challenge and hindrance and their various effects is made clear in the above-mentioned research, the *a priori* categorization of challenge and

hindrance prevents the measurement of between-person differences on how demands are appraised. In previous research, demands such as workload and time pressure were categorized as a challenge and demands such as role ambiguity and role conflict as a hindrance (Searle & Auton, 2014). This way of measuring challenge and hindrance contradicts the idea of the appraisal theory, where the same situation can be appraised in various ways by different people. It also precludes the possibility that one person can appraise a demand or stressful situation as both a hindrance and a challenge.

Following the appraisal theory, in this study we conceptualize hindrance and challenge as two separate constructs. We asked participants to appraise the job demands workload and task multiplicity in how hindering and how challenging they found them. We expect that when the demand is strongly appraised as a hinder it will have a positive effect on an individual's work stress and when the demand is strongly appraised as a challenge it will have a negative effect on work stress.

Workload. In previous research, workload is often defined as a challenge demand (Cavanaugh et al., 2000; LePine et al., 2005), where it is seen as something to overcome, something that motivates individuals to achieve their goals. Challenge demands are found to have a weaker positive relation with work stress than hindrance demands (Cavanaugh et al., 2000; LePine et al., 2005). We expected challenge appraisal to weaken the relationship between workload and work stress. However, in the group of academic personnel where the amount and pace of work is increasing (Van Engelshoven, 2019), it is possible that people will appraise workload as a hinder to their goals. Therefore, we expect hindrance appraisal to strengthen the relationship between workload and work stress.

Task multiplicity. Most academic personnel have educational, research-related, and administrative tasks. Moreover, transitions in the education, such as the transition from Dutch to English education, caused personnel to have additional tasks (Heerekop, 2019). Task

multiplicity is defined as “the degree to which the work involves multiple tasks” (Roe & Zijlstra, 2000, p. 7). When task multiplicity is high, employees need to prioritize which tasks are most important, which can increase work stress. We expect task multiplicity to have similar effects as workload, so that when task multiplicity is appraised as a hinder, the positive relationship with work stress will strengthen, and when task multiplicity is appraised as a challenge the positive relationship with work stress will weaken.

H2: Hindrance appraisal moderates the direct positive relationship of a) workload and b) task multiplicity with work stress, such that when hindrance appraisal is high, the relationship is strengthened.

H3: Challenge appraisal moderates the direct positive relationship of a) workload and b) task multiplicity with work stress, such that when challenge appraisal is high, the relationship is weakened.

Work Pressure

Work pressure has been found to have a negative relationship with employee well-being and a positive relationship with stress (Pluta & Rudawska, 2021; LePine et al., 2005; Roe & Zijlstra, 2000). However, as mentioned before, there is quite some ambiguity of the definitions of workload and work pressure in previous research (Bateman, 1981; Roe & Zijlstra, 2000; Pluta & Rudawska, 2021; Hofmans et al., 2015). This ambiguity makes it difficult to compare work pressure research. Additionally, it is not always clear if the researchers make a distinction between workload and work pressure. Roe and Zijlstra (2000) found that work pressure was a mediator between job demands and stress symptoms, such as fatigue and exhaustion. Because the definitions in this current study are based on the definitions by Roe and Zijlstra, we expect that in our model work pressure is also a mediator between the two job demands, workload and task multiplicity, and work stress. Work pressure will most likely have negative consequences because of the inability to fully cope with the

demands imposed on the employee. However, as described in Hypotheses 2 and 3, workload and task multiplicity are expected to have negative results when appraised as a hinder. This relationship is expected to be weakened when appraised as a challenge. Therefore, we hypothesize:

H4: The interaction effect of a) workload and b) task multiplicity with hindrance appraisal on work stress is mediated by work pressure.

H5: The interaction effect of a) workload and b) task multiplicity with challenge appraisal on work stress is mediated by work pressure.

Task Type

Most academic personnel have educational, research-related and administrative tasks to do in their work. The amount of time available for educational or research-related tasks differs per employee and position. Previous research has indicated that it is possible that different work sectors have different causes for work stress (Bakker & Sans-Vogel, 2013; Tadic et al., 2015). Therefore, it might be possible that individuals appraise demands related to a specific task differently than demands related to another task, which might cause certain tasks to lead to higher stress than others. We therefore explored if the model as depicted in Figure 1 would be different for the task types educational, research-related, and administrative tasks. This is analyzed by testing Hypotheses 4 and 5 for each task type.

Method

Participants

Participants for this survey study were the academic personnel in the Psychology Department of the University of Amsterdam (i.e., PhD-candidates, post-docs, lecturers, assistant professors, associate professors, and full professors). The focus of this study was on the academic personnel (rather than support staff), as these groups of the university employees experiences especially high work pressure (Heerekop, 2019).

A power analysis was conducted using G*Power 3.1 (Faul et al., 2009) for a multiple regression analysis with three predictors. Because previous research had not analyzed this model, and not used the same measurements, there was no clear expectation of effect size. A small to medium effect size ($f^2 = .07$) was chosen for the power analysis. The analysis showed that a sample size of at least 160 participants is necessary to have a power of .80 to detect small to medium effects with an alpha of .05.

In total 188 participants started the questionnaire. However, some data was excluded from the analyses. Specifically, the data of participants excluded were the participants who did not fall into the sample of academic personnel employed at the Psychology Department of the University of Amsterdam (10 were excluded), participants who did not consent to participate in the questionnaire (10 more were excluded), participants who had not filled in any of the items (6 more were excluded), and the questionnaires of participants who had opened the questionnaire less than 100 seconds (3 more were excluded). After excluding these data from the research, there were 159 (partially) completed questionnaires. Not all questions had to be answered by all participants and the demographic information was not mandatory to fill in. Therefore, the sample size for the specific analyses ranged between 117 and 159. Because the sample size of 160 participants was not reached, we chose to include the 90% confidence interval as well as the 95% confidence interval for hypotheses testing to prevent unnecessary rejection of the hypotheses.

The sample consisted of 78 women (49.1%), 52 men (33.3%), and 29 other or preferred not to say (18.2%). Age was filled in by 129 participants with an average of 37 years ($SD = 9.87$). Of the participants, 35 were lecturers (22%), 44 PhD-candidates or postdocs (27.7%), 42 assistant professors (26.4%), 19 associate or full professors (11.9%), and 19 (11.9%) opted not to fill in their position in the department. Of the participants 71 participants had a

permanent contract (44.7%), 69 participants had a temporary contract (43.4%), and 19 participants did not fill in this question (11.9%).

Design and Procedure

The hypotheses and exploratory question were analyzed using a quantitative cross-sectional design. Data was collected using an online survey. The survey consisted of self-reported measures, which allowed for the collection of the experiences of the participants. This study focused on the participant's experiences and appraisals instead of objective measures of job demands. Subjective measures of experiences allow for the analyses of how employees perceive the world rather than how the world objectively is. This is particularly important for hindrance and challenge research as it is the experience of situations that cause individuals to form appraisals and not the 'objective' existence of the situations itself. Lazarus (1999) explains this by stating that the subjective value of the possible loss or gain caused by a situation at work will help individuals to evaluate a situation as a challenge or a hindrance. When someone evaluates a situation as not important, they will not appraise it as such even when the situation is objectively present.

A link to a Qualtrics survey was distributed at the end of April 2022 using an email sent to all academic personnel of the Psychology Department of the University of Amsterdam. A reminder to fill in the questionnaire was sent one week and two weeks after the first distribution of the message. In the Qualtrics survey the participants were able to choose to fill in the questionnaire in Dutch or English. All participants received an information letter, explaining the purpose of the research. Moreover, the information letter stated that their answers would be completely anonymous and stored securely following the University of Amsterdam storing regulations. The participants were made aware that the survey was voluntary and that they could stop whenever they wanted, without giving a reason for doing so. The contact information of the researchers was given, so that the participants could make

contact for any questions or clarifications. After the information letter, the participants were asked to confirm that they had read and understood the information given to them and that they consented that their answers would be used in this research. After the participants' consent, they could start the survey. The information letter and consent form can be found in Appendix A.

Measures

Items of previous validated questionnaires were used, where some of the items were adjusted to fit with the current research sample and design. All items used can be found in Appendix B. This research was part of a larger project in which more variables were measured (Braakman & Van Hooft, 2022). Those variables were not included in this research. Using a Principal Components Analysis (PCA) with oblique rotation and a reliability analysis the variable scales were tested. One PCA was conducted for the variables work stress, work pressure and workload as we used the same items from Roe and Zijlstra (2000) but expected the items to fit to other variables. The factor loadings and Cronbach's α are listed in Table 1. Another PCA was conducted to test if the demands items could be separated into the four scales for educational workload, research-related workload, administrative workload, and task multiplicity. The factor loadings and Cronbach's α 's for these constructs are listed in Table 2. The results of the PCA's are discussed in the measurement sections below.

Work Stress. Work stress was defined as the affective state of worry and anxiety caused by work. Guided by this definition, three items of the Tilburg Work Pressure Questionnaire (T-WPQ; Roe & Zijlstra, 2000) and two items of the Questionnaire on the Experience and Evaluation of Work (QEEW; Van Veldhoven et al., 2015) were selected to measure work stress. Two sample items were "Lately work makes me uneasy and restless" and "During my free time, I often worry about work." The items could be answered from 1 (strongly disagree) to 5 (strongly agree). The factor loading of the first item of stress ("I'm

worried about backlogs in my work”) was found to be higher for the component work pressure (see Table 1). Because it was not clear where the item fitted best, we chose to remove the item from the analysis. The reliability for the 4-item scale was high ($\alpha = .90$).

Table 1*Principal Components Analysis Work Stress, Work Pressure, and Workload*

Items	1	2	3
<i>Work stress</i>			
I'm worried about backlogs in my work	.40	.51	.01
Work makes me uneasy and restless	.80	.02	.05
I find it difficult to relax at the end of the day	.87	.01	-.01
After a workday, I continue to worry about work problems	.98	-.08	-.03
During my free time, I worry about work	.88	.05	-.05
<i>Work pressure</i>			
My work is too demanding	.07	.68	.13
I have the feeling that I'm under pressure in my work.	.38	.41	.12
I have to work faster than I can.	.00	.91	-.16
I find it difficult to meet all the demands in my work	-.01	.86	-.10
I have to do more work than I actually want	.12	.62	.24
I have too much work to do	.04	.68	.22
<i>Workload</i>			
... I have a lot of work to do	-.02	.07	.88
... I have to deal with a backlog	.04	.47	.43
... I feel compelled to work fast	-.01	.13	.84
... My tasks have to be finished at fixed points in time	.02	-.15	.88
Eigenvalue	1.00	7.59	2.07
Variance	6.63%	50.62%	13.77%
Cronbach's α	.90	.87	.84

Note. Due to missing values N ranges from 140 to 159; The factor loadings higher than .4 are shown in bold; The Cronbach's α of the work stress scale is the reliability of the four items selected for the scale. Thus, Item 1 is excluded from the reliability analysis based on its factor loadings.

Work Pressure. Work pressure was defined as the subjective experience of pressure due to more or higher demands than the individual's capacity to cope with those demands. Based on this definition, the most fitting items of the Tilburg Work Pressure Questionnaire (T-WPQ; Roe & Zijlstra, 2000) were selected to measure work pressure. In total six items were used. Two examples of work pressure items were "I have the feeling that I'm under pressure in my work" and "I have to do more work than I actually want" which both could be answered with 1 (almost always) to 5 (never). Interpreting the PCA results (see Table 1), all items selected for work pressure fitted best with the work pressure construct. All items were included in the scale. The reliability for the scale was high ($\alpha = .87$).

Job Demands. *Workload*, defined as the experience of the amount and pace of work, was measured using four items of the T-WPQ (Roe & Zijlstra, 2000). The four items of workload were measured for educational, research-related, and administrative tasks. Thus, there were twelve items in total. All items started with "With regard to my [educational/research-related/administrative] tasks...". Two sample items were "... I have a lot of work to do" and "... I have to deal with a backlog". The items could be answered with 1 (almost always) to 5 (never). Because not all academic personnel have both educational and research-related tasks, a question was asked to investigate what percentage of the participants' contract was education and what percentage was research. Only when a participant indicated that they had at least some percentage educational or research-related tasks, they were asked to fill in the questions about workload concerning these tasks. In testing the Hypotheses 2a, 3a, 4a, and 5a, in which no distinction is made between different tasks, the mean of the three workload items were used to create a general workload score. The general workload scale was found to be distinct from the variables work stress and work pressure, although Item 2 did fit in with the work pressure scale as well as with the workload scale (see Table 1). However, the reliability was high ($\alpha = .84$) and did not improve much when the item was deleted.

Additionally, in the PCA where workload was assessed for the three task types (see Table 2), Item 2 did fit in best with the corresponding scale. Therefore, it was decided to keep Item 2 included in the workload scale.

Another PCA was conducted for all job demands, including educational workload, research-related workload, administrative workload, and task multiplicity (see Table 2). The factor loadings for Item 4 of workload (“... My tasks have to be finished at fixed points in time”) indicate that it is not clear if this item fits best with educational workload. However, because the item does fit clearly in the scales for research-related and administrative workload and cannot be interpreted as part of the task multiplicity scale the item is still included in the scale for educational workload. The reliabilities of the scales were moderate to high (educational workload: $\alpha = .81$; research-related workload: $\alpha = .76$; administrative workload: $\alpha = .86$).

Task multiplicity was defined as the “the degree to which the work involves multiple tasks” (Roe & Zijlstra, 2000, p. 7). Task multiplicity was measured using three items of the T-WPQ (Roe & Zijlstra, 2000). In this research we assumed that all academic personnel have at least the various tasks in the categories educational and administrative tasks. Other participants have educational, administrative, and research-related tasks. Because task multiplicity was about multiple tasks no distinction was made between educational, research-related, and research-related task multiplicity. An example of an item was “In my job I have to do multiple things at the same time” which could be answered from 1 (almost always) to 5 (never). According to the PCA (see Table 2), all three items of task multiplicity fitted best to this construct. Thus, all three items are included in the scale. The reliability of the scale was moderate ($\alpha = .75$).

Hindrance and Challenge Appraisal. Hindrance and challenge appraisal were separately measured using two items, which were asked for each of the job demands items.

Table 2

Principal Components Analysis for the Job Demands: Administrative, Research-related, and Administrative Workload and Task Multiplicity

Items	1	2	3	4
<i>Educational Workload</i>				
... I have a lot of work to do	.90	-.12	-.05	.03
... I have to deal with a backlog	.86	.12	.06	.05
... I feel compelled to work fast	.80	.01	.01	-.15
... My tasks have to be finished at fixed points in time	.36	-.05	-.15	-.39
<i>Research-related Workload</i>				
... I have a lot of work to do	.36	.79	.07	-.13
... I have to deal with a backlog	.07	.70	.02	-.11
... I feel compelled to work fast	-.11	.83	-.03	-.17
... My tasks have to be finished at fixed points in time	.12	.70	-.13	.28
<i>Administrative Workload</i>				
... I have a lot of work to do	-.12	.03	-.93	-.03
... I have to deal with a backlog	-.02	.07	-.80	.00
... I feel compelled to work fast	-.02	-.07	-.92	-.01
... My tasks have to be finished at fixed points in time	.13	-.03	-.70	.00
<i>Task Multiplicity</i>				
In my job I have to multiple things at the same time	-.05	.06	.00	-.91
There are conflicts between the tasks I have to perform	.20	.17	-.13	-.47
I have to divide my time over multiple tasks	.05	.04	-.06	-.83
Eigenvalue	5.01	2.10	1.73	1.26
Variance	33.73%	14.02%	11.51%	8.43%
Cronbach's α	.81	.76	.86	.75

Note. Due to missing values N ranges from 117 to 159; Factor loadings higher than .4 are shown in bold text.

From the hindrance and challenge items by Searle and Auton (2015) one item for hindrance and one item for challenge was chosen. The item selected for challenge appraisal was “it will help me to learn and develop”. The item selected for hindrance appraisal was “it will limit how well I can perform”. These two items were repeated after every item for the measured

job demands, which leads to twelve items for workload hindrance (workload hindrance $\alpha = .89$; educational workload hindrance $\alpha = .83$; research-related workload hindrance $\alpha = .74$; administrative workload hindrance $\alpha = .94$), twelve items for workload challenge (workload challenge $\alpha = .84$; educational workload challenge $\alpha = .73$; research-related workload challenge $\alpha = .72$; administrative workload challenge $\alpha = .89$), three items for task multiplicity hindrance ($\alpha = .77$), and three items for task multiplicity challenge ($\alpha = .82$). In total there were 15 items to measure hindrance appraisal and 15 items to measure challenge appraisal. All scales had moderate to high reliability. For example, for workload a sample item for challenge appraisal was “[Thinking of my educational tasks...] ... the need to work fast helps me to learn and develop.” and a sample item for hindrance appraisal was “[Thinking of my research-related tasks...] ... a backlog limits how well I can perform.”. An example for the appraisal of task multiplicity was “Having to divide my time over multiple tasks helps me to learn and develop.” The responses to these items were obtained using a 5-point Likert-scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Control Variables. In this research age, gender (male, female, non-binary, other), and function (PhD-Candidate/Post-doctoral, lecturer, assistant professor, associate professor/full professor) were included in the questionnaire, as previous research showed that women and younger employees have higher work pressure and higher stress ratings (UvA, 2017; Cavanaugh et al., 2000). The questions asking for the participant’s age, gender, and function were not mandatory to fill in. The variable age was measured using the question “What is your age?” which could only be answered with a numeric answer. Any impossible answers, such as being 9999 years old, were coded as missing values. Gender was operationalized with the question “What is your gender?”, which could be answered with male, female, non-binary, or prefer not to say. Male was coded as 0, female as 1 and, because of the low frequency, non-binary as missing value. Prefer not to say was also recoded as missing value.

The variable function was operationalized with the question “What is your job title?”. The participants could choose between lecturer, PhD-Candidate/Post-doctoral, assistant professor, or associate professor/full professor. Lecturer and PhD-Candidate/Post-doctoral were coded as 1, assistant professor as 2, and associate professor/full professor as 3. PhD-Candidate/Post-doctoral and lecturer were merged into one category because it was expected they would have similar influence on work pressure and work stress, due to the nature of tasks and responsibilities they have. It is possible that function type and age are highly correlated. After the bivariate analysis, it was decided which control variable was included in further analysis.

Data Analysis

Descriptive statistics were conducted to do a first investigation of the measured variables by looking at the mean, standard deviation, and the range of the variables. Then, a bivariate analysis was conducted to investigate the correlations between all variables, and to select which control variables to include.

To test Hypothesis 1 a multiple regression was used to investigate the relationship between work pressure and work stress, while controlling for any of the measured control variables which were related to work pressure or work stress. A multiple regression was used to be able to include possible control variables. Hypotheses 2 and 3 were tested using a moderation model (Model 1) in the PROCESS macro in SPSS (Hayes, 2018). For Hypothesis 2, the interaction of hinder appraisal and job demands on work stress was investigated. For Hypothesis 3, the interaction of challenge appraisal and job demands on work stress is investigated. Hypotheses 4 and 5 were tested using a mediated moderation model (Model 7) in the PROCESS macro, where the interaction effect specified in Hypotheses 2 and 3 is mediated by work pressure.

Results

Assumption Checks

Before testing the hypotheses, the assumptions for linear regression were checked. The P-P plots indicate that work stress, work pressure, workload, task multiplicity, and challenge and hindrance appraisal for both workload and task multiplicity had a normal distribution. Residual statistics show that there were no outliers that influenced the data. The Durbin-Watson Test indicated that the residuals were uncorrelated (Durbin-Watson value = 2.03). The scatterplot of the standardized predicted values showed that the assumptions of homogeneity of variance and linearity were met. Normal probability plots show that the assumptions of normality and homoscedasticity were met. None of the variance inflation factor (VIF) values of the predictors were higher than 5, suggesting that multicollinearity was not a concern (Work pressure, Tolerance = .64, VIF = 1.56; Workload, Tolerance = .55, VIF = 1.83; Task multiplicity, Tolerance = .61, VIF = 1.64).

Descriptives and Correlations

Descriptives and zero-order correlations were calculated before testing the hypotheses. All variable means, standard deviations and correlations can be found in Table 3. The means show that work stress ($M = 2.88$, $SD = 1.02$) and work pressure ($M = 2.91$, $SD = 0.96$) are below but close to the scale mean of 3. The means of the two job demands workload ($M = 3.19$, $SD = 0.69$) and task multiplicity ($M = 3.89$, $SD = 0.86$) are above the scale mean. Age was found not to be significantly related to work stress ($r = -.04$, $p = .639$) or to work pressure ($r = .05$, $p = .609$). Gender was also found to be not significantly related to work stress ($r = .14$, $p = .101$) and work pressure ($r = .04$, $p = .666$). As both control variables were not related to the independent variable work stress or to the mediator work pressure, they were not included in the analyses to test the hypotheses. Function was found to be significantly correlated to work pressure ($r = .20$, $p = .019$) but not to work stress ($r = .00$, $p = .971$). Because function was found to be significantly related to the mediator work pressure, function is included as a control variable in the hypotheses testing.

Table 3*Means, standard deviation and correlations.*

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Age	36.95	9.87										
2. Gender ^a	.60	0.49	-.19*									
3. Function ^b	1.57	0.72	.63**	-.27**								
4. Work Stress	2.88	1.02	-.04	.14	.00							
5. Work Pressure	2.91	0.96	.05	.04	.20*	.69**						
6. Workload	3.19	0.69	.22*	.02	.31**	.63**	.57**					
7. Task Multiplicity	3.89	0.86	.12	-.02	.33**	.33**	.48**	.58**				
8. Hindrance appraisal Workload	3.23	0.67	.17	-.11	.22**	.34**	.49**	.71**	.45**			
9. Challenge appraisal Workload	2.43	0.66	-.17	.05	-.27**	-.18*	-.29**	-.18*	-.33**	-.23**		
10. Hindrance appraisal Task Multiplicity	3.75	0.79	-.06	-.02	.06	.35**	.44**	.40**	.38**	.47**	-.24**	
11. Challenge appraisal Task Multiplicity	2.75	0.83	-.09	.01	-.23**	-.27**	-.29**	-.27**	-.24**	-.31**	.45**	-.50**

Note. Due to missing values *N* ranges from 117 to 159; * $p < .05$; ** $p < .01$; ^a 0 = Men, 1 = Women, and other/prefer not to say was coded as missing values. ^b Ordinal variable where 1 = Lectures, PhD candidates and postdoctoral, 2 = Assistant professors, and 3 = Associate professors.

Hypothesis Testing

Hypothesis 1

Hypothesis 1, where work pressure is expected to have a positive relationship with work stress, was tested with a linear regression. The results show a significant negative relationship between function and work stress, $B = -0.20$, $\beta = -.14$, $SE = 0.09$, $t(155) = -2.23$, $p = .027$, 95%CI [-0.38, -0.02], 90%CI [-0.35, -0.05] and a significant positive relationship between work pressure and work stress, $B = 0.75$, $\beta = 0.70$, $SD = 0.07$, $t(155) = 11.06$, $p < .001$, 95%CI [0.62, 0.88], 90%CI [0.64, 0.86]. Work pressure explained 47.2% of the incremental variance in work stress, while controlling for function, $F(1, 155) = 61.12$, $p < .001$. Thus, the results support Hypothesis 1.

Hypotheses 2 and 3

In Hypothesis 2a and 2b a moderation effect of hindrance appraisal on the relationship between a) workload and b) task multiplicity with work stress was expected. To test Hypothesis 2a and 2b, Model 1 in the PROCESS macro for SPSS (Hayes, 2013) was used with 5000 bootstrapped samples. An analysis of the main effects indicated that the control variable function did not have a significant relationship with work stress in this model, $B = -0.18$, $SE = 0.12$, $t(139) = -1.57$, $p = .119$, 95%CI [-0.41, 0.05], 90%CI [-0.37, 0.01]. Workload had a significant positive relationship with work stress, $B = 0.37$, $SE = 0.17$, $t(139) = 2.25$, $p = .026$, 95%CI [0.05, 0.70], 90%CI [0.10, 0.65]. The hindrance appraisal of workload had a marginally significant positive relationship with work stress, $B = 0.33$, $SE = 0.17$, $t(139) = 1.95$, $p = .053$, 95%CI [0.00, 0.67], 90%CI [0.05, 0.62]. The interaction between workload and the hindrance appraisal of workload was not significant, $B = -0.00$, $SE = 0.15$, $t(139) = 0.03$, $p = .975$, 95%CI [-0.30, 0.31], 90%CI [-0.25, 0.26]. Thus, there was no moderation

effect found. Hypothesis 2a is, therefore, not supported. The model itself was significant and explained 17.6% of the variance, $F(4, 135) = 10.60, p < .001$.

The same steps were made to test Hypothesis 2b, where first the main effects of task multiplicity and hindrance appraisal of task multiplicity on work stress were analyzed. Analysis of the main effects show that the control variable function did not have a significant relation with work stress, $B = -0.16, SE = 0.12, t(139) = -1.34, p = .183, 95\%CI [-0.39, 0.07], 90\%CI [-0.35, 0.04]$. Task multiplicity had a significant positive relationship with work stress, $B = 0.33, SE = 0.11, t(139) = 3.17, p = .002, 95\%CI [0.13, 0.54], 90\%CI [0.16, 0.51]$. The hindrance appraisal of task multiplicity had also a significant positive relationship with work stress, $B = 0.32, SE = 0.11, t(139) = 2.88, p = .005, 95\%CI [0.10, 0.55], 90\%CI [0.14, 0.51]$. The interaction of task multiplicity and hindrance appraisal was found to be not significant, $B = 0.02, SE = 0.14, t(139) = 0.12, p = .903, 95\%CI [-0.26, 0.29], 90\%CI [-0.21, 0.25]$. Thus, there is no evidence for a moderation effect and Hypothesis 2b is not supported. The model was significant and explained 18.5% of the variance, $F(4, 135) = 7.67, p < .001$.

In Hypothesis 3a and 3b, a moderation effect of challenge appraisal on the relationship between a) workload and b) task multiplicity with work stress was expected. As with Hypothesis 2, Model 1 in the PROCESS macro for SPSS (Hayes, 2013) was used with 5000 bootstrapped samples for this analysis. In this model, including challenge appraisal, the control variable function had a significant negative relationship with work stress, $B = -0.24, SE = 0.12, t(139) = -1.98, p = .049, 95\%CI [-0.47, 0.00], 90\%CI [-0.43, -0.04]$. Workload had a significant positive relationship with work stress, $B = 0.59, SE = 0.12, t(139) = 4.86, p < .001, 95\%CI [0.35, 0.83], 90\%CI [0.39, 0.79]$. The challenge appraisal of workload had a significant negative relationship with work stress, $B = -0.28, SE = 0.13, t(139) = -2.18, p = .031, 95\%CI [-0.53, -0.03], 90\%CI [-0.49, -0.07]$. The interaction between workload and the

challenge appraisal of workload was not found to be significant, $B = 0.13$, $SE = 0.17$, $t(139) = 0.75$, $p = .453$, 95%CI [-0.21, 0.47], 90%CI [-0.16, 0.42]. The overall model was significant and explained 18% of the variance, $F(4, 135) = 10.70$, $p < .001$.

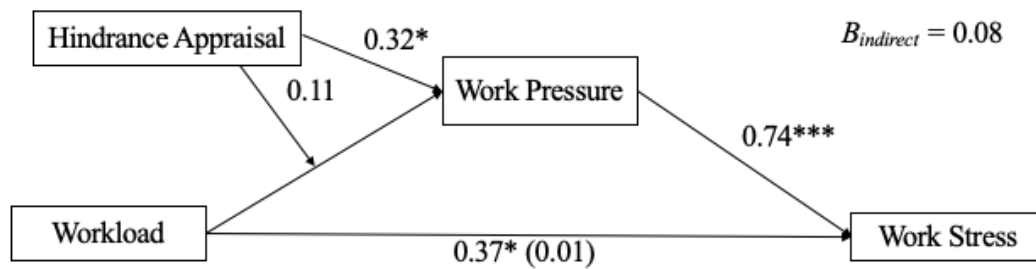
In the analysis of Hypothesis 3b, the control variable function was found to be negatively related to work stress, $B = -0.24$, $SE = 0.12$, $t(139) = -2.02$, $p = .045$, 95%CI [-0.47, -0.01], 90%CI [-0.44, -0.04]. The main effect of task multiplicity was found to have a significant positive relationship with work stress, $B = 0.40$, $SE = 0.10$, $t(139) = 4.10$, $p < .001$, 95%CI [0.21, 0.60], 90%CI [0.24, 0.56]. The challenge appraisal of task multiplicity had a significant negative relationship with work stress, $B = -0.30$, $SE = 0.10$, $t(139) = -2.93$, $p = .004$, 95%CI [-0.50, -0.10], 90%CI [-0.47, -0.13]. The interaction effect between task multiplicity and the challenge appraisal of task multiplicity did not have a significant relationship with work stress, $B = 0.02$, $SE = 0.13$, $t(139) = 0.16$, $p = .871$, 95%CI [-0.24, 0.28], 90%CI [-0.20, 0.24]. The model was significant and explained 18.3% of the variance, $F(4, 135) = 7.56$, $p < .001$. No evidence was found for a moderation effect when testing for Hypothesis 3a and 3b, therefore both hypotheses are not supported.

Hypotheses 4 and 5

Although the moderations were found to be non-significant in Hypotheses 2 and 3, the mediated moderation was tested to investigate the moderation effect on work pressure and the mediating role of work pressure. In Hypotheses 4 and 5 a mediated moderation model was tested using Model 7 in the PROCESS macro for SPSS (Hayes, 2013) with 5000 bootstrapped samples for this analysis. The control variable function was included. Because of the non-significance of Hypotheses 2 and 3, the expectation was that Hypotheses 4 and 5 would also be non-significant. In the following result section, the most important and noteworthy results are mentioned. The complete results can be found in Appendix C.

Figure 2

Interaction of Hindrance Appraisal on the Relationship Between Workload and Work Stress as Mediated by Work Pressure.

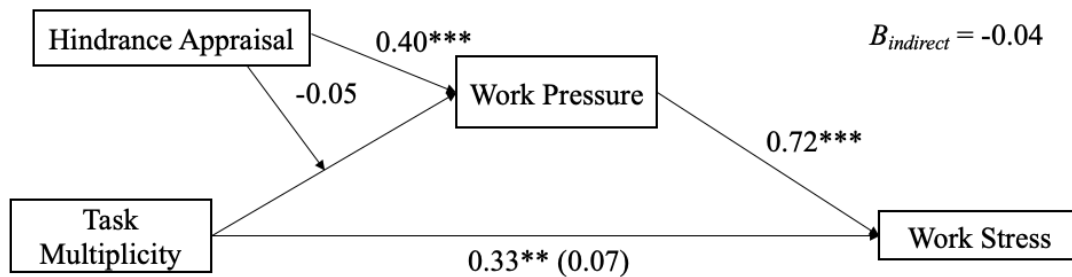


Note. Unstandardized regression coefficients for the interaction between workload and the hindrance appraisal of workload on work stress as mediated by work pressure. The regression coefficient for the relationship between workload and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$. $B_{indirect} (-1SD) = 0.38$, 95%CI [0.16, 0.64], 90%CI [0.19, 0.59], $B_{indirect} (+1SD) = 0.49$, 95%CI [0.25, 0.73], 90%CI [0.28, 0.68].

Hypotheses 4. The main effects indicated that both workload (see Figure 2) and task multiplicity (see Figure 3) had significant positive relationships with work pressure. Hindrance appraisal also had a significant positive relationship with work pressure, however, the interaction effect of hindrance appraisal on the relationship between the job demands and work pressure was not significant. When work pressure was entered in the model as mediator, the relationship between the two job demands and work stress became non-significant. In both models the relationship between work pressure and work stress was significant. The indirect effects indicated that the mediated moderation was not significant. The mediation model was significant when hindrance appraisal was high and when hindrance appraisal was low. Thus, there is a full mediation where workload and task multiplicity were related to work pressure and indirectly to work stress, whether hindrance appraisal was high or low. Therefore, Hypothesis 4a and 4b were partially supported.

Figure 3

Interaction of Hindrance Appraisal on the Relationship Between Task Multiplicity and Work Stress as Mediated by Work Pressure.

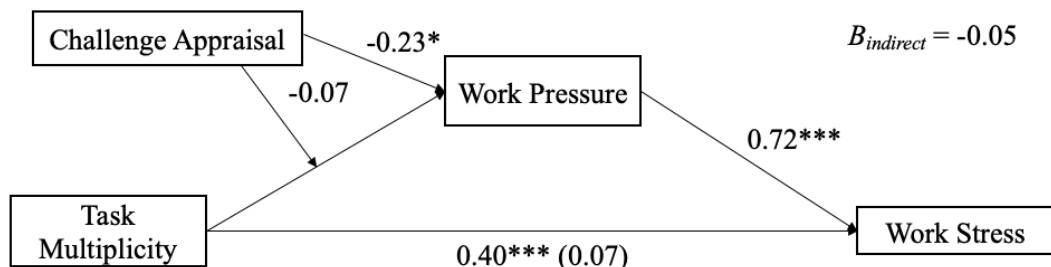


Note. Unstandardized regression coefficients for the interaction between task multiplicity and the hindrance appraisal of task multiplicity on work stress as mediated by work pressure. The regression coefficient for the relationship between task multiplicity and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$. $B_{indirect} (-1SD) = 0.31$, 95%CI [0.16, 0.47], 90%CI [0.19, 0.44], $B_{indirect} (+1SD) = 0.25$, 95%CI [0.03, 0.46], 90%CI [0.07, 0.43].

Hypothesis 5 was tested using the same analysis of Hypothesis 4, namely Model 7 of the PROCESS macro for SPSS with 5000 bootstrapped samples (Hayes, 2013). The main effects indicated that workload and task multiplicity had significant positive relationships with work pressure. The hinderance and challenge appraisals of the two job demands were also found to have a significant direct relationship with work pressure, where hinderance appraisal was positively related and challenge appraisal was negatively related to work pressure. The interaction effect of challenge appraisal on the relationship between the two job demands and work pressure was not found to be significant. Work pressure had, as in the other models, a significant relationship with work stress. When work pressure was entered in the model the relationship between the job demands and work stress became not significant. Together with the significant indirect relationships, the results indicate a significant full mediation model. The mediated moderation effect for the model with task multiplicity was not significant (see Figure 4).

Figure 4

Interaction of Challenge Appraisal on the Relationship Between Task Multiplicity and Work Stress as Mediated by Work Pressure.

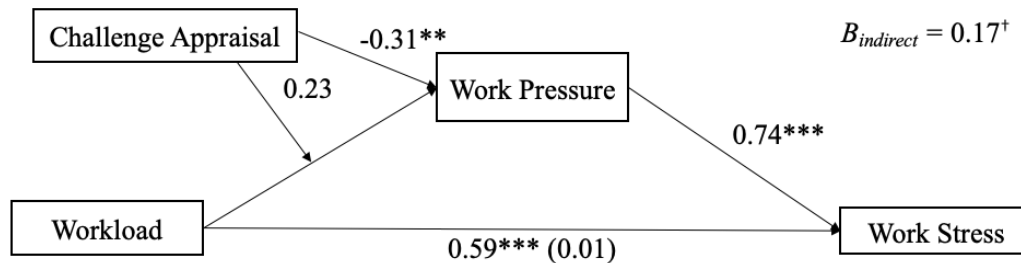


Note. Unstandardized regression coefficients for the interaction between task multiplicity and the challenge appraisal of task multiplicity on work stress as mediated by work pressure. The regression coefficient for the relationship between task multiplicity and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$. $B_{indirect} (-1SD) = 0.40$, 95%CI [0.20, 0.56], 90%CI [0.23, 0.53], $B_{indirect} (+1SD) = 0.31$, 95%CI [0.15, 0.50], 90%CI [0.17, 0.47].

However, while the interaction effect was not significant, the mediated moderation effect for the model with workload was marginally significant (see Figure 5), $B_{indirect} = 0.17$, 95%CI [-0.02, 0.35], 90%CI [0.02, 0.32]. The indirect effect was positively significant when challenge appraisal of workload was low ($-1SD$), $B_{indirect} = 0.47$, 95%CI [0.30, 0.66], 90%CI [0.33, 0.63], and positively significant when challenge appraisal of workload was high ($+1SD$), $B_{indirect} = 0.69$, 95%CI [0.46, 0.93], 90%CI [0.50, 0.89]. The interaction effect on work pressure is visualized in Figure 6. These results indicate that higher workload will lead to higher work pressure and indirectly to more work stress when the challenge appraisal of workload is high and when it is low. However, when the experienced workload is low, a high challenge appraisal of workload will have lower impact on work pressure than when challenge appraisal is low. When the experienced workload is high, low and high challenge appraisal will have a similar effect on work pressure. The interaction is not as expected in the hypotheses. Thus, Hypothesis 5 is partially supported

Figure 5

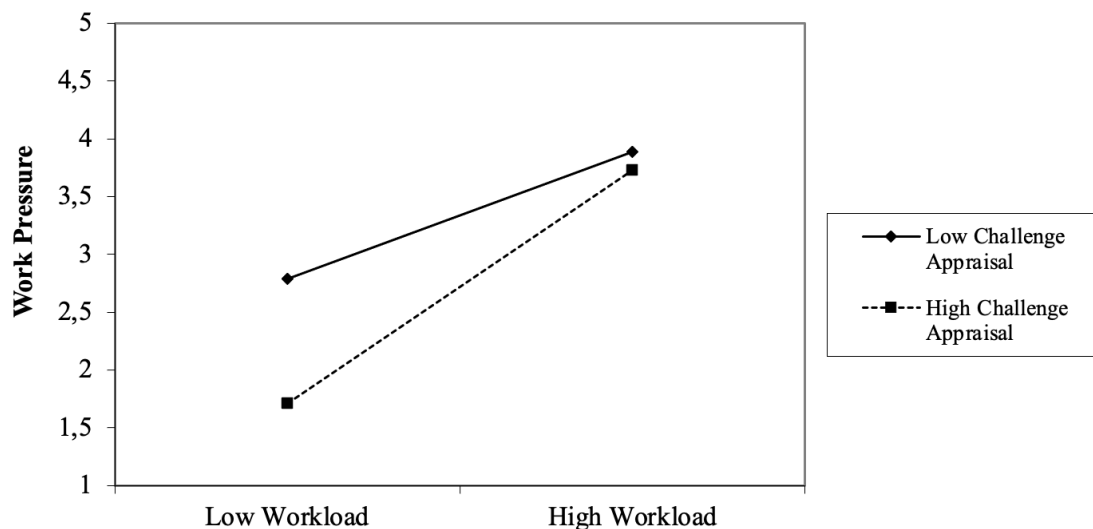
Mediated Moderation Model. Interaction of Challenge Appraisal on the Relationship Between Workload and Work Stress as Mediated by Work Pressure.



Note. Unstandardized regression coefficients for the interaction between workload and the challenge appraisal of workload on work stress as mediated by work pressure. The regression coefficient for the relationship between workload and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$, † Marginally significant where 0 is not included in the 90% confidence interval. $B_{indirect} (-1SD) = 0.47$, 95%CI [0.30, 0.66], 90%CI [0.33, 0.63], $B_{indirect} (+1SD) = 0.69$, 95%CI [0.46, 0.93], 90%CI [0.50, 0.89].

Figure 6

The Moderating Effect of Challenge Appraisal of Workload on the Relation between Workload and Work Pressure



Exploratory Analyses

Lastly, we explored whether the mediated moderation model tested in the Hypotheses 4 and 5 was different for the three task types, educational tasks, research-related tasks, and administrative tasks. This question is answered in an exploratory test where the model is tested for the different task types. The models were not statistically compared.

In Table 4 the means and standard deviations of the experienced workload and the hindrance and challenge appraisal of workload are listed for each task type. The correlations to work pressure and work stress are also included. Interestingly, administrative tasks and the challenge and hindrance appraisal of administrative tasks are not significantly correlated to work stress where all other variables are. Additionally, challenge appraisal of administrative workload is not significantly correlated to work pressure.

Table 4

Means, Standard Deviations and Correlations to Work Pressure and Work Stress

	<i>M</i>	<i>SD</i>	Work Pressure	Work Stress
Educational Workload	3.38	0.94	.56**	.41**
Research-related Workload	3.47	0.83	.48**	.43**
Administrative Workload	3.37	1.06	.25**	.11
Educational Workload Hindrance	3.43	0.87	.49**	.41**
Research-related Workload Hindrance	3.37	0.72	.35**	.37**
Administrative Workload Hindrance	2.91	1.06	.26**	.15
Educational Workload Challenge	2.46	0.73	-.29**	-.23**
Research-Related Workload Challenge	2.67	0.75	-.30**	-.19*
Administrative Workload Challenge	2.20	0.89	-.10	-.06

Note. Due to missing values *N* ranges from 117 to 159. * $p < .05$, ** $p < .01$.

Table 5*Mediated Moderation Standardized Coefficients*

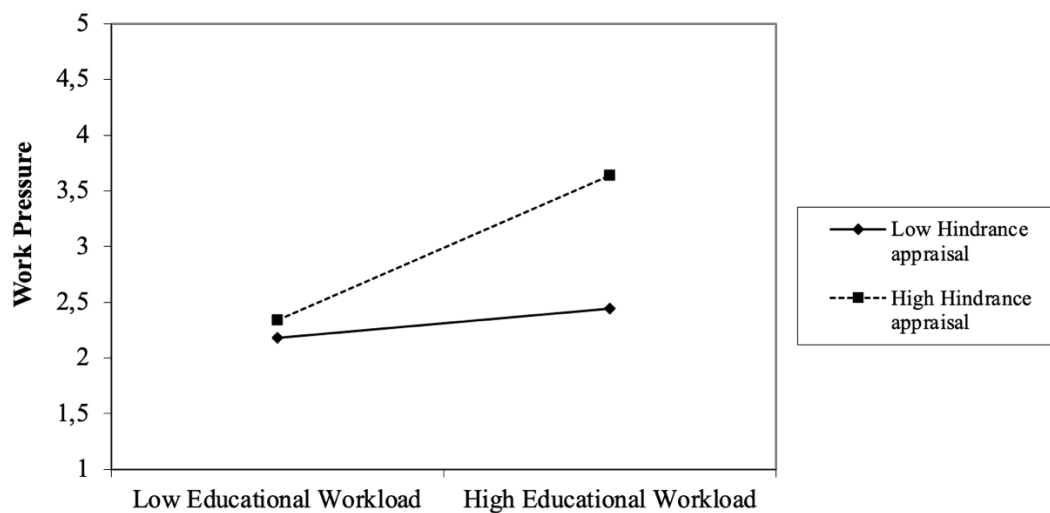
	Educational Workload (<i>B</i>)	Research-related Workload (<i>B</i>)	Administrative Workload (<i>B</i>)
<i>N</i>	139	117	140
Interaction with Hindrance Appraisal	0.19*	0.10	0.06
Interaction with Challenge Appraisal	0.04	0.05	0.05

Note. The coefficients for the mediated moderation effect are shown in the table. * Significant relation when 0 is not included in the 95% confidence interval.

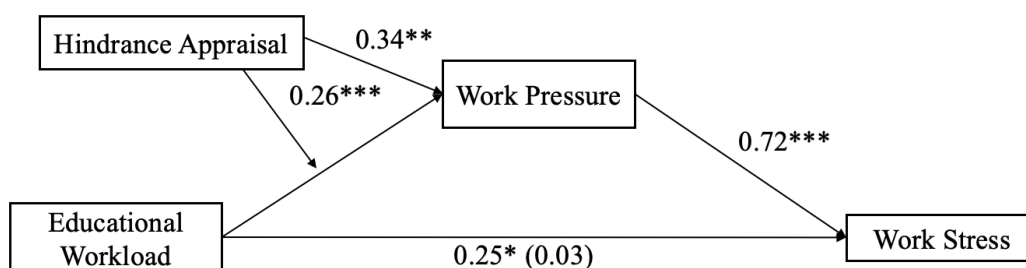
In Table 5 the standardized coefficients of the mediated moderations are shown for hindrance and challenge appraisal per task type. Further analysis with Model 7 of the PROCESS macro (Hayes, 2013), showed that in this model educational workload had a significant positive relationship with work pressure, $B = 0.39$, $SE = 0.09$, $t(138) = 4.16$, $p < .001$, 95%CI [0.21, 0.58], hindrance appraisal of educational workload had a significant positive relationship with work pressure, $B = 0.34$, $SE = 0.7$, $t(138) = 3.32$, $p = .001$, 95%CI [0.14, 0.55], and the interaction between these two also had a significant positive relationship with work pressure, $B = 0.26$, $SE = 0.09$, $t(138) = 3.85$, $p < .001$, 95%CI [0.13, 0.39]. The moderating effect on work pressure is visualized in Figure 7. When work pressure is included as mediator the relationship between educational workload and work stress became non-significant, $B = 0.03$, $SE = 0.08$, $t(138) = 0.35$, $p = .728$, 95%CI [-0.13, 0.19]. Work pressure had a significant positive relationship with work stress, $B = 0.72$, $SE = 0.08$, $t(138) = 8.93$, $p < .001$, 95%CI [0.57, 0.89]. The mediated moderation model is visualized in Figure 8.

Figure 7

The Moderating Effect of Challenge Appraisal of Educational Workload on the Relation between Educational Workload and Work Pressure.

**Figure 8**

The Relationship Between the Interaction Effect of Educational Workload and Challenge Appraisal of Educational Workload and Work Stress as Mediated by Work Pressure



Note. Unstandardized regression coefficients for the interaction between educational workload and the challenge appraisal of educational workload on work stress as mediated by work pressure. The regression coefficient for the relationship between educational workload and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$.

An analysis of the indirect effects showed that the relationship between educational workload and work stress mediated by work pressure is significant when the hindrance appraisal of educational workload is high (+1SD), $B_{indirect} = 0.45$, 95%CI [0.25, 0.66], but is not significant when the hindrance appraisal of educational workload is low (-1SD), $B_{indirect} = 0.12$, 95%CI [-0.07, 0.30]. This means that only when the hindrance appraisal of educational workload is high, higher educational workload led to higher work pressure and indirectly to higher work stress.

Because the other mediated moderations were not significant their models were not included in this article.

Discussion

Increasing work pressure and its impact on work stress among academic personnel (Heerekop, 2019) makes it crucial to understand what the predictors of work pressure are. The results in the current research showed that among academic personnel the two job demands workload and task multiplicity positively relate to work stress. Moreover, this relationship was fully mediated by work pressure. Thus, when academic personnel experiences workload and task multiplicity, they are likely to experience higher work pressure and indirectly work stress. Although the interaction effects of hindrance and challenge appraisal on the relationship between the two job demands and work stress was not found significant, the interaction of challenge appraisal on the relationship between workload on work stress fully mediated by work pressure was significant. Additionally, the mediated moderation effect was found significant for the relationship between educational workload and work pressure moderated by hinderance appraisal with an indirect relationship with work stress. In all mediated moderation models the direct relationships between the appraisals variables and work pressure were significant, where hindrance appraisal was positively related to work

pressure and work stress and challenge appraisal was negatively related to work pressure and work stress. This shows the importance of both the job demands and their appraisal in managing work pressure and work stress among academic personnel. The findings in this research provide several theoretical and practical implications on the causes of work pressure and work stress.

Theoretical Implications

First, in previous research various, sometimes overlapping, definitions are given for workload and work pressure (e.g., Bateman, 1981; Roe & Zijlstra, 2000; Pluta & Rudawska, 2020). We conceptually distinguished these constructs using the definitions by Roe and Zijlstra (2000). Based on these definitions we carefully selected items to measure the variables. The distinction between these constructs was empirically supported in this study with the use of a principal components analysis. Defining these constructs and making clear how they are operationalized are important for future research, so that research can be compared to and differentiated with each other. A more detailed validation research of the workload, work pressure and work stress variables could help to create a fully validated questionnaire for research of these three variables. There was some ambiguity with the workload items where they did not always fit best with their corresponding scale. More research on workload in general and workload specific for certain tasks is needed for a validated questionnaire.

Second, in this research the job demands workload and task multiplicity were not *a priori* categorized into a challenge or hindrance demand as some of the previous research did (e.g., Cavanaugh et al., 2000; LePine et al., 2005). Moreover, most research expected that workload would be a challenge demand, and therefore, have a less negative outcome than hindrance demands. The moderation analyses in this research show that higher workload and

task multiplicity lead to higher work stress regardless of the hindrance and challenge appraisal. The moderation effect was not found to be significant. This shows that how someone appraises their workload or task multiplicity does not strengthen or weaken the effect it will have on work stress. This finding is in line with the Job Demands-Resources theory which explains that high job demands lead to more stress (Demerouti et al., 2001; Bakker et al., 2004). However, it contradicts the theories on hindrance and challenge appraisals where it is expected that job demands will lead to higher work stress when appraised as a hinder and to lower work stress when appraised as a challenge (Lazarus, 1999; Searle & Auton, 2015). However, it is important to note that the correlations and direct effects of hindrance and challenge appraisal did have the expected significant relationships, where higher hindrance appraisal is related to higher work pressure and higher work stress and where higher challenge appraisal is related to lower work pressure and lower work stress. Future research might be able to investigate when challenge and hindrance appraisal have this impact on work pressure and work stress.

Third, as mentioned the moderation effects were not found to be significant in most of the hypothesis's testing. There are three explanations that could have caused this. First, theoretically it can be explained that the appraisals did not matter in the relevant models, where job demands lead to higher work pressure and work stress regardless of how they were appraised. Second, the sample size of 159 participants did not secure a high enough power to prevent unnecessary rejection of hypotheses. Finally, the measurements of the hindrance and challenge appraisals included the items for the two job demands. Therefore, it is possible that the interaction was already included in the appraisal measurements instead of measuring the demand and appraisal separately. This could explain why the moderation was found non-significant, while the direct relationship of the appraisals with work pressure and work stress

was found to be significant. The direct relationships were as expected, where hindrance appraisal was positively related and challenge appraisal was negatively related to work pressure and work stress.

Third, in the mediated moderation models, significant mediation effects were found. The relationship between the two job demands and work stress was fully mediated by work pressure. This confirms the previous evidence of work pressure as a mediator in the research by Roe and Zijlstra (2000). All models showed that high workload or high task multiplicity led to higher work pressure and indirectly to higher work stress in this sample of academic personnel. Future research could investigate if the mediation differs in other work sectors.

Fourth, the mediated moderation effects were not significant except in the model where the moderating effect of challenge appraisal on the relationship between workload and work stress as mediated by work pressure was tested. This model indicated that higher workload always leads to higher work pressure and indirectly to higher work stress whether the challenge appraisal is high or low. Additionally, the model showed that when the experienced workload is low, appraising the workload as a challenge will have less of an impact on work pressure than when the workload is not appraised as a challenge. This exception makes it clearer that high job demands will lead to high work pressure and work stress. But when employees are in a state of low demands, such as low experienced workload, a challenge appraisal can help lessen the effect of workload on work pressure. This combines the hindrance and challenge framework by Lazarus (1999) – which states that appraising a demand as a challenge will lead to lower stress – and the JDR theory – which states that high job demands lead to higher stress (Demerouti et al., 2001; Bakker et al., 2004). This effect was only found for the challenge appraisal of workload but not for task multiplicity. This raises the question for which other job demands a challenge appraisal could help lessen the

effect on work pressure and indirectly on work stress. Future research could test this for other job demands, for example task complexity, intensity, and emotiveness of tasks.

Furthermore, in the exploratory analyses it was found that educational workload only leads to work pressure and indirectly to work stress when it is appraised as a hinder as opposed to when it is not appraised as a hinder. This indicates that there are differences between task types and how the appraisal of these tasks influences its effects on work pressure and work stress. Difference between task types might not be limited to the academic world. Future research could investigate the effects of difference in task type in other work fields as well as the relation between task type and their appraisals.

Finally, before the exploratory analysis, we had a cautious expectation that administrative tasks would be the strongest of the three task types to lead to work pressure when experienced as a hinder and indirectly lead to work stress. This was mostly based on the idea that because of more students, relatively less academic personal, and not enough funding the number of administrative tasks would increase (Van Engelshoven, 2019; Naidoo-Chetty & Du Plessis, 2021). The results of the analyses of administrative workload indicated that appraisal did not matter in the relationship with work pressure or work stress. One explanation is that because the tasks are not too complex, they are not seen as a hinder as often as educational tasks, which might explain the lower mean for hindrance appraisal of administrative workload ($M = 2.91$) compared to the mean of hindrance appraisal of educational workload ($M = 3.43$). Research by Jimmieson and Terry (1999) showed that control is an important aspect of someone's experience of task demands, especially when it is a complex task. Less control over complex educational tasks, compared to the relatively easier administrative tasks, is an aspect that might influence the difference between the task types.

Practical Implications

As seen in the results, high workload and high task multiplicity was related to higher work pressure and indirectly to work stress, suggesting that one of the first recommendations to decrease work pressure and work stress among academic personnel is to decrease the amount, pace, and variability of their tasks. However, there are some exceptions and nuances to consider.

First, the results of this study show that when there is low workload, a high challenge appraisal will reduce the impact of workload on work pressure compared to a low challenge appraisal. Therefore, creating an environment where employees do not have too much workload and appraise their workload as a challenge can help manage the work pressure and work stress of employees. Moreover, even though the interactions between the two job demands and their appraisal as a hinder or challenge on work stress were not significant, the correlations indicate that appraising a demand as a hinder will lead to higher work pressure and work stress, while appraising a demand as a challenge will lead to lower work pressure and stress. Thus, simply lowering job demands might not be enough. To decrease work pressure and work stress employers should stimulate challenge appraisal. An example on how to stimulate challenge appraisal is discussing how tasks can help in reaching employees goals or how employees can learn and develop from these tasks. Additionally, tasks could be distributed to the members of a team who appraises them more as a challenge than a demand.

Second, hindrance appraisal of workload was positively related with the hindrance appraisal of task multiplicity. It is possible that when academic personnel experiences hinder in one job demand they are more likely to also appraise other job demands as a hinder, resulting in higher work pressure and work stress. Preventing hindrance appraisal of one job

demand, might then also help to lessen the hindrance appraisal of other job demands.

Eventually, this helps to decrease work pressure and work stress.

Finally, when educational workload is not appraised as hinder it will not lead to higher work pressure and indirectly not to higher work stress. It is then crucial for organizations to realize that decreasing the amount of hindrance appraisal of one task type, for example administrative tasks, is not enough to decrease work pressure and work stress. Among academic personnel, decreasing the amount of educational workload and preventing hindrance appraisal of educational tasks can help decrease work pressure and work stress. A possible way to prevent hindrance appraisal could be showing recognition for their work, which was previously found to be important for employee well-being (Clark & Mahadi, 2017).

Limitations and Suggestions for Future Research

The current research has some limitations to consider when interpreting its results. First, because the intended minimum of 160 participants was not reached, a 90% confidence interval was included when testing the hypotheses as well as a 95% confidence interval. This prevents unnecessary rejection of the hypothesis. However, it should be noted that the significant mediated moderation model was only significant when interpreting the 90% confidence interval. It is important to test this model as well as the others with a larger sample to confirm the conclusions made in this research.

Second, this research is fully correlational, meaning that none of the relations have been tested for causal or directional effects. The relationships might even be reversed or bidirectional. For example, we found a significant positive relationship between hindrance appraisal of workload and work pressure. This relationship could be reversed in such a way that when employees experience work pressure they are more likely to appraise job demands

as a hinder. Longitudinal research, in for example a diary study, should be conducted to create a clearer a picture of the influence of time in the relationships between job demands, work pressure and work stress. Especially because previous research has proposed that continuous work pressure leads to higher stress (Pluta & Rudawska, 2020; Alarcon, 2011), the short term versus long term effects of high job demands and high work pressure on work stress should be researched in a longitudinal study. Moreover, a longitudinal study can investigate if the experienced workload and task multiplicity differ in certain times of the year, for example, in periods at the start of semester compared to close to or after exams.

A concern in interpreting the results of the exploratory research, is that no definition was given for educational, research-related, and administrative tasks. Especially administrative tasks can be interpreted differently by the participants. There are administrative tasks that are part of your general job, such as administrating hours worked and financial declarations. However, other administrative tasks can be categorized as part of educational or research-related tasks. For example, administrating students' grades into the university's online learning platform can be interpreted as an educational or administrative task. Therefore, it is possible that some participants have included administrative tasks in their educational tasks. In the correlational analysis it showed that administrative workload in contrast to educational and research-related workload only had a significant correlation with work pressure and not with work stress. Different outcomes could be found when future research categorizes which tasks are considered educational, research-related, and administrative.

Additionally, the current research has focused on two job demands and the hindrance and challenge appraisal of these demands. Personal resources or differences in personality were not included. Traits such as the big five (Grant & Langan-Fox, 2006; Andrisano

Ruggieri et al., 2020) and resilience (Mitchell et al., 2019) have been found to effect stress and stress related symptoms. Personal resources such as self-efficacy, proactivity (Ramaci et al., 2021) and internal locus of control (Gray-Stanley & Muramatsu, 2011) can buffer the effects of job demands on work stress. Including personal resources and traits could impact the models tested in this research. Future research might want to investigate these personality traits and personal resources, because of their possible influence on the models.

Conclusion

A prolonged period with high work pressure can result in a decrease of physical and psychological well-being (Pluta & Rudawska, 2020; Alarcon, 2011), including higher work stress. Numerous job demands have been found to be related to higher work stress (Bakker et al., 2004; Bakker et al., 2021). Although previous research found that there are differences in challenge and hindrance demands (Cavanaugh et al., 2000; LePine et al., 2005), the current study provides contradicting evidence that high workload and high task multiplicity results in higher work stress regardless of whether the hindrance and challenge appraisal of the job demand is high or low. This relation is fully mediated by work pressure where workload and task multiplicity are related to higher work stress through the increase of work pressure. The direct relationships between hinderance and challenge appraisal on the one hand and work pressure and work stress on the other hand were found significant. Hindrance appraisal was positively related to work pressure and work stress and challenge appraisal was negatively related to work pressure and work stress. Thus, promoting challenge appraisal and preventing hindrance appraisal of job demands is a possible solution to the high work pressure experienced among academic personnel. With these results this study contributes to the literature concerning job demands and the hindrance and challenge framework. In the exploratory research, results showed that there are differences in the model tested between

task types, which indicates that decreasing workload in administrative tasks, might not have the desired effect of decreasing work pressure. Organizations should be conscious of the fact that decreasing workload or preventing hindrance appraisal in one task type is not always the best course of action. Among academic personnel, it is more useful to decrease educational workload and the hindrance appraisal of educational workload to decrease work pressure and indirectly work stress.

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Appendix A – Information Letter and Informed Consent

Information letter

Dear participant,

Thank you for your interest! This questionnaire is used for examining the causes of work pressure and work stress. We are very interested in how you experience your work, regardless whether you experience high or low workload and stress. Before you fill in the questionnaire, it is important that you are informed about the research procedures. If anything is unclear, please don't hesitate to contact the researchers to ask for clarification.

Goal of the study. The goal of this survey study is to investigate the causes of work pressure and work stress in the Psychology Department. To this purpose we examine the role of various job demands and job resources.

Procedure. In this study, you will be asked to fill in a questionnaire via Qualtrics. The questionnaire includes statements asking about your experiences related to your job. In addition, we will ask for some demographic information. You can fill in the questionnaire in your own time. You can pause the questionnaire to resume later. This is only possible if you fill it in on the same device. The questionnaire will take approximately 15 minutes.

Your data. Your answers will be anonymously saved so no information can be traced back to you. The dataset is securely stored on the UvA servers using the UvA data storage protocol.

Voluntary participation. There are no consequences if you decide not to participate in this study. During the questionnaire, you are free to stop participating at any moment without giving a reason for doing so.

Discomfort, risks, and insurance. As with any research at the University of Amsterdam, standard liability insurance applies.

Your privacy is guaranteed. You will not be asked to provide any personally identifying information during this study. Your research data will be analyzed by the researchers that collected the information. Research data published in scientific journals will be anonymous and cannot be traced back to you as an individual. Completely anonymized data can be shared with other researchers.

Further information. Should you have questions about this study at any given moment, please contact the responsible researchers.

Thank you,

Mari Braakman (m.a.j.braakman@uva.nl)

Edwin van Hooft (e.a.j.braakman@uva.nl)

Informed consent

In this form, we refer to the information letter describing the research in which you participate. By agreeing to this form, you declare that you understand the nature and methods of this study as described in the information letter. In this form, you are consenting to participate in both the Qualtrics demographics questionnaire about work pressure and work stress.

As a participant you also declare the following:

- You have read and understood the information letter.
- You agree to participate in this study and agree with the use of the data that are collected.
- You have the right to withdraw your participation from the study at any moment without providing a reason.

Should you have questions about this study, please contact the responsible researchers: Edwin van Hooft (e.a.j.vanhooft@uva.nl) or Mari Braakman (m.a.j.braakman@uva.nl). Formal complaints about this study can be addressed to the Ethics Review Board; Dhr. Dr. Matthijs Baas (M.Baas@uva.nl). For questions about the processing of your personal data you can also contact the data protection officer of the University of Amsterdam via fg@uva.nl.

- I agree, start the survey.
- I do not agree, stop the survey.

Appendix B – Questionnaire items

Participants could choose to fill in the questionnaire in Dutch or English. Below all the items are shown. The cursive text shows the English version.

Work stress

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

1. Ik maak me zorgen over achterstanden in mijn werk*
*a. I'm worried about backlogs in my work**
2. Werk maakt me onrustig en nerveus
a. Work makes me uneasy and restless
3. Ik vind het moeilijk om te ontspannen aan het eind van de werkdag
a. I find it difficult to relax at the end of the day
4. Na mijn werkdag blijf ik me zorgen maken over problemen op werk.
a. After a workday, I continue to worry about work problems.
5. In mijn vrije tijd maak ik me zorgen over werk.
a. During my free time, I worry about work.

* Item 1 was deleted based on the PCA results.

Work pressure

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

1. Het werk vraagt te veel van mij.
a. My work is too demanding.
2. Ik heb het gevoel dat ik in mijn werk onder druk sta.
a. I have the feeling that I'm under pressure in my work.
3. Ik moet sneller werken dan ik kan.
a. I have to work faster than I can.
4. Ik vind het moeilijk om te voldoen aan alle eisen die het mijn werk stelt
a. I find it difficult to meet all the demands in my work.
5. Ik moet meer werk doen dan ik eigenlijk zou willen
a. I have to do more work than I actually want.
6. Ik heb te veel werk te doen

- a. *I have too much work to do*

Educational Tasks

Workload

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

Met betrekking tot mijn onderwijstaken, *With regard to my educational tasks...:*

1. heb ik veel taken te doen.
 - a. ... *I have a lot of work to do.*
2. heb ik te maken met een achterstand.
 - a. ... *I have to deal with a backlog.*
3. ... ben ik genoodzaakt om snel te werken.
 - a. ... *I feel compelled to work fast.*
4. ... moeten mijn taken op een vastgelegd moment klaar zijn.
 - a. ... *my tasks have to be finished at fixed points in time.*

Hindrance and Challenge Appraisal

Answered with: Helemaal mee oneens, oneens, neutraal, eens, helemaal mee eens; *Completely disagree, disagree, neutral, agree, completely agree*

Denkend aan mijn onderwijstaken, *Thinking of my educational tasks...:*

1. ... beperkt de veelheid aan taken hoe goed ik kan presteren
 - a. *he multitude of tasks limits how well I can perform*
2. ... beperkt een achterstand hoe goed ik kan presteren
 - a. ... *a backlog limits how well I can perform*
3. ... beperkt de noodzaak om snel te werken hoe goed ik kan presteren
 - a. ... *the need to work fast limits how well I can perform*
4. ... beperken deadlines voor mijn taken hoe goed ik kan presteren
 - a. ... *deadlines limit how well I can perform*
5. ... helpt de veelheid aan taken mij om te leren en ontwikkelen
 - a. ... *the multitude of tasks helps me to learn and develop*
6. ... helpt een achterstand mij om te leren en ontwikkelen
 - a. ... *a backlog helps me to learn and develop*
7. ... helpt de noodzaak om snel te werken mij om te leren en ontwikkelen
 - a. ... *the need to work fast helps me to learn and develop*

8. ... helpen deadlines voor mijn taken mij om te leren en ontwikkelen
 - a. ... *deadlines help me to learn and develop.*

Research-related Tasks

Workload

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

Met betrekking tot mijn onderzoekstaken, *With regard to my research-related tasks:*

1. heb ik veel taken te doen.
 - a. ... *I have a lot of work to do.*
2. heb ik te maken met een achterstand.
 - a. ... *I have to deal with a backlog.*
3. ... ben ik genoodzaakt om snel te werken.
 - a. ... *I feel compelled to work fast.*
4. ... moeten mijn taken op een vastgelegd moment klaar zijn.
 - a. ... *my tasks have to be finished at fixed points in time.*

Hindrance and Challenge Appraisal

Answered with: Helemaal mee oneens, oneens, neutraal, eens, helemaal mee eens; *Completely disagree, disagree, neutral, agree, completely agree*

Denkend aan mijn onderzoekstaken, *Thinking of my research-related tasks:*

1. ... beperkt de veelheid aan taken hoe goed ik kan presteren
 - a. ... *the multitude of tasks limits how well I can perform*
2. ... beperkt een achterstand hoe goed ik kan presteren
 - a. ... *a backlog limits how well I can perform*
3. ... beperkt de noodzaak om snel te werken hoe goed ik kan presteren
 - a. ... *the need to work fast limits how well I can perform*
4. ... beperken deadlines voor mijn taken hoe goed ik kan presteren
 - a. ... *deadlines limit how well I can perform*
5. ... helpt de veelheid aan taken mij om te leren en ontwikkelen
 - a. ... *the multitude of tasks helps me to learn and develop*
6. ... helpt een achterstand mij om te leren en ontwikkelen
 - a. ... *a backlog helps me to learn and develop*
7. ... helpt de noodzaak om snel te werken mij om te leren en ontwikkelen
 - a. ... *the need to work fast helps me to learn and develop*

8. ... helpen deadlines voor mijn taken mij om te leren en ontwikkelen
 - a. ... *deadlines help me to learn and develop.*

Administrative tasks

Workload

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

Met betrekking tot mijn administratieve taken, *With regard to my administrative tasks,:*

1. heb ik veel taken te doen.
 - a. ... *I have a lot of work to do.*
2. heb ik te maken met een achterstand.
 - a. ... *I have to deal with a backlog.*
3. ... ben ik genoodzaakt om snel te werken.
 - a. ... *I feel compelled to work fast.*
4. ... moeten mijn taken op een vastgelegd moment klaar zijn.
 - a. ... *my tasks have to be finished at fixed points in time.*

Hindrance and Challenge Appraisal

Answered with: Helemaal mee oneens, oneens, neutraal, eens, helemaal mee eens; *Completely disagree, disagree, neutral, agree, completely agree*

Denkend aan mijn administratieve taken, *Thinking of my administrative tasks:*

1. ... beperkt de veelheid aan taken hoe goed ik kan presteren
 - a. ... *the multitude of tasks limits how well I can perform*
2. ... beperkt een achterstand hoe goed ik kan presteren
 - a. ... *a backlog limits how well I can perform*
3. ... beperkt de noodzaak om snel te werken hoe goed ik kan presteren
 - a. ... *the need to work fast limits how well I can perform*
4. ... beperken deadlines voor mijn taken hoe goed ik kan presteren
 - a. ... *deadlines limit how well I can perform*
5. ... helpt de veelheid aan taken mij om te leren en ontwikkelen
 - a. ... *the multitude of tasks helps me to learn and develop*
6. ... helpt een achterstand mij om te leren en ontwikkelen
 - a. ... *a backlog helps me to learn and develop*
7. ... helpt de noodzaak om snel te werken mij om te leren en ontwikkelen
 - a. ... *the need to work fast helps me to learn and develop*

8. ... helpen deadlines voor mijn taken mij om te leren en ontwikkelen
 - a. ... *deadlines help me to learn and develop.*

Task multiplicity

Answered with: Zelden of nooit, soms, regelmatig, vaak, erg vaak of altijd; *Rarely or never, sometimes, regularly, often, very often or always*

1. Ik moet in mijn werk meerdere dingen tegelijkertijd doen
 - a. *In my job I have to do multiple things at the same time*
2. Er zijn conflicten tussen de taken die ik moet uitvoeren
 - a. *There are conflicts between the tasks I have to perform*
3. Ik moet mijn tijd over meerdere taken verdelen
 - a. *I have to divide my time over multiple tasks*

Hindrance and Challenge Appraisal

Answered with: Helemaal mee oneens, oneens, neutraal, eens, helemaal mee eens; *Completely disagree, disagree, neutral, agree, completely agree*

1. Meerdere dingen tegelijkertijd moeten doen beperkt hoe goed ik kan presteren
 - a. *Having to do multiple things at the same time limits how well I can perform.*
2. Het moeten verdelen van mijn tijd over meerdere taken beperkt hoe goed ik kan presteren
 - a. *Having to divide my time over multiple tasks limits how well I can perform.*
3. Conflicten tussen mijn taken beperkt hoe goed ik kan presteren.
 - a. *Conflicts between my tasks limit how well I can perform.*
4. Meerdere dingen tegelijkertijd moeten doen helpt mij om te leren en ontwikkelen.
 - a. *Having to do multiple things at the same time helps me to learn and develop*
5. Het moeten verdelen van mijn tijd over meerdere taken helpt mij om te leren en ontwikkelen.
 - a. *Having to divide my time over multiple tasks helps me to learn and develop*
6. Conflicten tussen mijn taken helpen mij om te leren en ontwikkelen.
 - a. *Conflicts between my task help me to learn and develop.*

Appendix C – Complete Results Hypotheses 4 and 5

Hypothesis 4

Although the moderations were found to be non-significant in Hypotheses 2 and 3, the mediated moderation was tested to investigate the moderation effect on work pressure and the mediating role of work pressure. In Hypotheses 4 and 5 a mediated moderation model is tested. We used Model 7 in the PROCESS macro for SPSS (Hayes, 2013) with 5000 bootstrapped samples for this analysis. The control variable function is included.

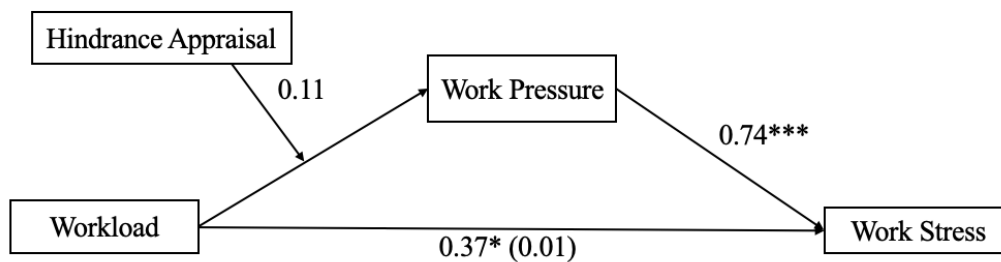
The total effect of the interaction between workload and the hindrance appraisal of workload on work stress was found to be non-significant in Hypothesis 2a. Further analysis indicates that the control variable function did not have a significant relationship with work pressure, $B = 0.03$, $SE = 0.09$, $t(139) = 0.32$, $p = .748$, 95%CI [-0.16, 0.22], 90%CI [-0.13, 0.19]. Workload had a significant positive relationship with work pressure, $B = 0.58$, $SE = 0.14$, $t(139) = 4.27$, $p < .001$, 95%CI [0.31, 0.85], 90%CI [0.36, 0.81]. Hindrance appraisal of workload was significantly positively related to work pressure, $B = 0.32$, $SE = 0.14$, $t(139) = 2.30$, $p = .0232$, 95%CI [0.04, 0.60], 90%CI [0.09, 0.56]. The interaction of workload and the hindrance appraisal of workload on work pressure was not significant, $B = 0.11$, $SE = 0.13$, $t(139) = 0.86$, $p = .392$, 95%CI [-0.14, 0.35], 90%CI [-0.10, 0.19].

When work pressure was entered in the model as mediator, the control variable function became significantly related to work stress, $B = -0.20$, $SE = 0.09$, $t(139) = -2.19$, $p = .030$, 95%CI [-0.39, -0.02], 90%CI [-0.36, -0.05]. The relationship between workload and work stress became non-significant, $B = 0.01$, $SE = 0.12$, $t(139) = 0.12$, $p = .905$, 95%CI [-0.21, 0.24], 90%CI [-0.18, 0.21]. Additionally, the relation between work pressure and work stress is positive and significant, $B = 0.74$, $SE = 0.08$, $t(139) = 9.06$, $p < .001$, 95%CI [0.58, 0.91], 90%CI [0.61, 0.88].

In hypothesis 4b we expected a mediated moderation where the moderation between task multiplicity and the hindrance appraisal of task multiplicity on work stress was fully mediated by work pressure. The total effect of the moderation effect on work stress was not supported as seen in the results for Hypothesis 2b. Analysis of the mediated moderation model showed that the control variable function did not have a significant relationship with work pressure, $B = 0.08$, $SE = 0.10$, $t(139) = 0.85$, $p = .396$, 95% CI [-0.11, 0.28], 90% CI [-0.8, 0.25]. Task multiplicity did have a significant positive relationship with work pressure, $B = 0.39$, $SE = 0.09$, $t(139) = 4.34$, $p < .001$, 95% CI [0.21, 0.56], 90% CI [0.24, 0.53]. Hindrance appraisal also has a significant positive relationship with work pressure, $B = 0.40$, $SE = 0.10$, $t(139) =$

Figure 6

The Relationship Between the Interaction Effect of Workload and Hindrance Appraisal of Workload and Work Stress as Mediated by Work Pressure



Note. Unstandardized regression coefficients for the interaction between workload and the hindrance appraisal of workload on work stress as mediated by work pressure. The regression coefficient for the relationship between workload and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$.

4.21, $p < .001$, 95% CI [0.21, 0.59], 90% CI [0.24, 0.56]. The moderation effect of task multiplicity and the hindrance appraisal of task multiplicity was not significantly related to

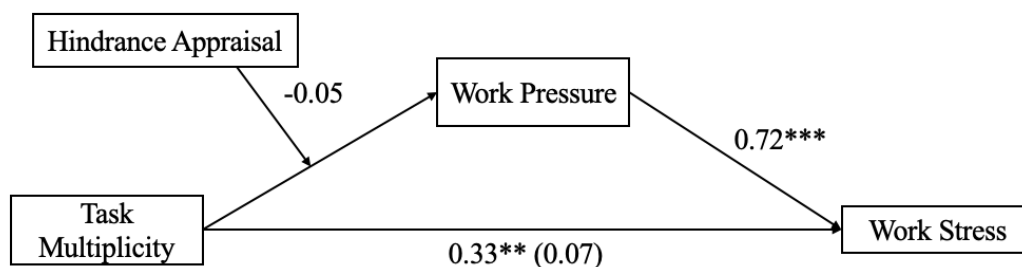
work pressure, $B = -0.05$, $SE = 0.12$, $t(139) = -0.42$, $p = .674$, 95%CI [-0.24, 0.14], 90%CI [-0.30, 0.15].

In contrast to the total effect model where the control variable function did not have a significant relationship with work stress, when work pressure was entered in the model as a mediator function did have a significant negative relation with work stress, $B = -0.22$, $SE = 0.09$, $t(139) = -2.35$, $p = .020$, 95%CI [-0.40, -0.03], 90%CI [-0.37, -0.06]. Task multiplicity became non-significantly related to work stress, $B = 0.07$, $SE = 0.09$, $t(139) = 0.75$, $p = .457$, 95%CI [-0.11, 0.24], 90%CI [-0.08, 0.21]. Work pressure did have a significant positive relationship with work stress, $B = 0.72$, $SE = 0.08$, $t(139) = 9.41$, $p < .001$, 95%CI [0.57, 0.87], 90%CI [0.59, 0.85].

The mediated moderation model was not found significant as the 95% and the 90% confidence interval did include 0, $B_{\text{indirect}} = -0.04$, 95%CI [-0.20, 0.12], 90%CI [-0.18, 0.09]. The indirect effect of task multiplicity to work stress through work pressure was found significant when hindrance appraisal for task multiplicity was low (-1SD), $B_{\text{indirect}} = 0.31$, 95%CI [0.16, 0.47], 90%CI [0.19, 0.44], and when hindrance appraisal for task multiplicity was high (+1SD), $B_{\text{indirect}} = 0.25$, 95%CI [0.03, 0.46], 90%CI [0.07, 0.43]. This can be interpreted that the relationship between task multiplicity and work stress is fully mediated by work pressure whether the hindrance appraisal for task multiplicity is low or high. Thus, Hypothesis 4b is partially supported.

Figure 7

The Relationship Between the Interaction Effect of Workload and Challenge Appraisal of Workload and Work Stress as Mediated by Work Pressure



Note. Unstandardized regression coefficients for the interaction between task multiplicity and the hindrance appraisal of task multiplicity on work stress as mediated by work pressure. The regression coefficient for the relationship between task multiplicity and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$.

Hypothesis 5

Hypothesis 5 was tested using the same analysis of Hypothesis 4, Model 7 of the PROCESS macro for SPSS with 5000 bootstrapped samples (Hayes, 2013).

The total effect of the interaction between workload and the challenge appraisal of workload was found to be not significant in Hypothesis 3a. However, the mediated moderation model was still valuable to test, to analyze the moderation effect on work pressure and the mediating effect of work pressure. Results of the mediated moderation model show that the control variable function does not have a significant relationship with work pressure, $B = -0.03$, $SE = 0.10$, $t(139) = -0.30$, $p = .763$, 95%CI [-0.22, 0.16], 90%CI [-0.19, 0.13], workload had a significant positive relationship with work pressure, $B = 0.78$, $SE = 0.10$, $t(139) = 8.02$, $p < .001$, 95%CI [0.59, 0.98], 90%CI [0.62, 0.95], and challenge appraisal of workload had a significant negative relationship with work pressure, $B = -0.31$, $SE = 0.10$, $t(139) = -3.00$, $p = .003$, 95%CI [-0.52, -0.11], 90%CI [-0.48, -0.14]. The interaction effect of workload and the challenge appraisal of workload does not have a significant effect, $B = 0.23$, $SE = 0.14$, $t(139) = 1.64$, $p = .103$, 95%CI [-0.05, 0.50], 90%CI [0.00, 0.46].

The direct effects on work stress where work pressure is included in the model, the control variable function is found to be significantly and negatively related to work stress, $B = -0.20$, $SE = 0.09$, $t(139) = -2.19$, $p = .030$, 95%CI [-0.39, -0.02], 90%CI [-0.36, -0.05]. With work pressure in the model workload became non-significant, $B = 0.01$, $SE = 0.12$, $t(139) = 0.12$, $p = .905$, 95%CI [-0.21, 0.24], 90%CI [-0.18, 0.21]. Work pressure had a significant positive relationship with work stress, $B = 0.74$, $SE = 0.08$, $t(139) = 9.06$, $p < .001$, 95%CI [0.58, 0.91], 90%CI [0.61, 0.88].

Although the interaction between workload and the challenge appraisal of workload was not significant, the mediated moderation was found to be marginally significant as 0 was included in the 95% confidence interval but was not included in the 90% confidence interval, $B_{indirect} = 0.17$, 95%CI [-0.02, 0.35], 90%CI [0.02, 0.32]. The indirect effect was positively significant when challenge appraisal of workload was low ($-1SD$), $B_{indirect} = 0.47$, 95%CI [0.30, 0.66], 90%CI [0.33, 0.63], and positively significant when challenge appraisal of workload was high ($+1SD$), $B_{indirect} = 0.69$, 95%CI [0.46, 0.93], 90%CI [0.50, 0.89]. The interaction effect on work pressure is visualized in Figure 8. These results mean that higher workload will lead to higher work pressure and indirectly to more work stress when the challenge appraisal of workload is high and when it is low. However, when the experienced workload is low, a high challenge appraisal of workload will have lower impact on work pressure than when challenge appraisal is low. When the experienced workload is high, low and high challenge appraisal will have a similar effect on work pressure. This is not what was expected in the Hypothesis. Thus, Hypothesis 5a is partially supported.

The total effect of the relation between task multiplicity and work stress was found to be significant and the interaction effect of task multiplicity and the challenge appraisal of task multiplicity on work stress was found to be non-significant in Hypothesis 3b. Further analysis

indicated that the control variable function did not have a significant relationship with work pressure, $B = 0.01$, $SE = 0.10$, $t(139) = 0.12$, $p = .905$, 95%CI [-0.19, 0.22], 90%CI [-0.16, 0.18], a significant positive relationship between task multiplicity and work pressure, $B = 0.49$, $SE = 0.09$, $t(139) = 5.75$, $p < .001$, 95%CI [0.32, 0.66], 90%CI [0.35, 0.63], and a significant negative relationship between challenge appraisal of task multiplicity and work pressure, $B = -0.23$, $SE = 0.09$, $t(139) = -2.57$, $p = .011$, 95%CI [-0.40, -0.05], 90%CI [-0.37, -0.08]. The interaction effect of task multiplicity and the challenge appraisal of task multiplicity on work pressure was not significant, $B = -0.07$, $SE = 0.11$, $t(139) = 0.53$, $p = .530$, 95%CI [-0.30, 0.15], 90%CI [-0.26, 0.12].

The control variable function did have a significant negative relationship with work stress, $B = -0.22$, $SE = 0.09$, $t(139) = -2.35$, $p = .020$, 95%CI [-0.40, -0.03], 90%CI [-0.37, -0.06]. Where task multiplicity had a significant relationship with work stress in Hypothesis 3b, when work pressure was added to the model as a mediator, the relationship between task

Figure 8

The Moderating Effect of Challenge Appraisal of Workload on the Relation between Workload and Work Pressure

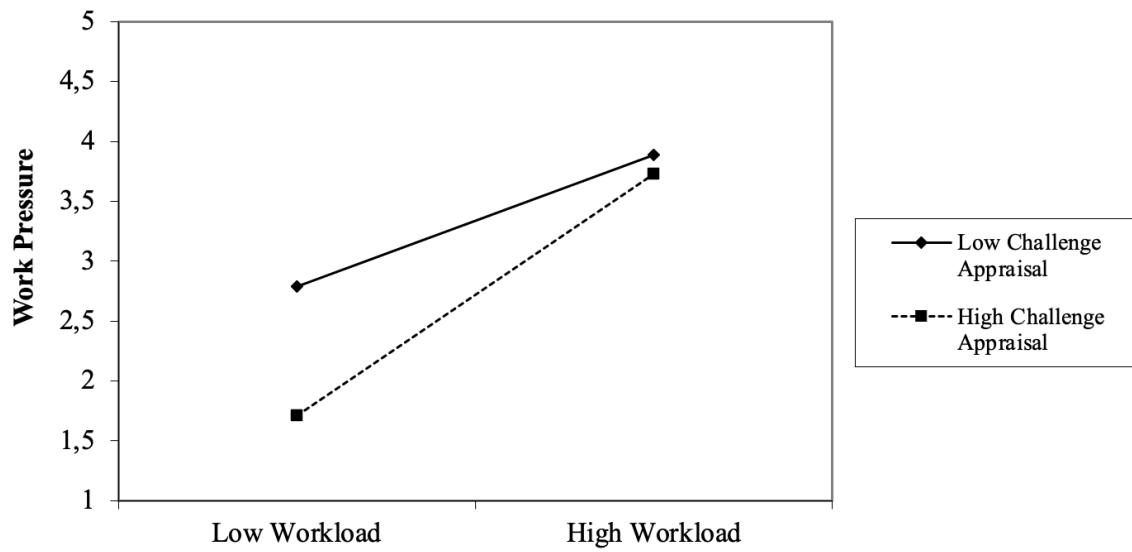
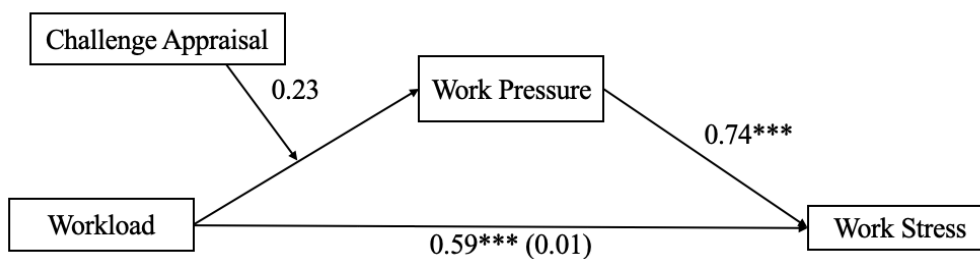


Figure 9

The Relationship Between the Interaction Effect of Workload and Challenge Appraisal of Workload and Work Stress as Mediated by Work Pressure



Note. Unstandardized regression coefficients for the interaction between workload and the challenge appraisal of workload on work stress as mediated by work pressure. The regression coefficient for the relationship between workload and work stress, while controlling for work pressure, is in parentheses. The control variable function was included in this model. * $p < .05$, ** $p < .01$, *** $p < .001$.

multiplicity and work stress became non-significant, $B = 0.07$, $SE = 0.09$, $t(139) = 0.75$, $p = .457$, 95%CI [-0.11, 0.24], 90%CI [-0.08, 0.21]. As in the other models, work pressure had a significant positive relationship with work stress, $B = 0.72$, $SE = 0.08$, $t(139) = 9.41$, $p < .001$, 95%CI [0.57, 0.87], 90%CI [0.59, 0.85].

The mediated moderation effect was not significant, $B_{indirect} = -0.05$, 95%CI [-0.19, 0.12], 90%CI [-0.17, 0.09]. The indirect effect of task multiplicity on work stress mediates by work pressure was significant when challenge appraisal of task multiplicity was low ($-1SD$), $B_{indirect} = 0.40$, 95%CI [0.20, 0.56], 90%CI [0.23, 0.53], and significant when challenge appraisal of task multiplicity was high ($+1SD$), $B_{indirect} = 0.31$, 95%CI [0.15, 0.50], 90%CI [0.17, 0.47]. Based on these results, it can be interpreted that work pressure fully mediates the relationship between task multiplicity and work stress, whether challenge appraisal of work pressure is low or high. Thus, Hypothesis 5b is partially supported.