Reducing demands or optimising demands?

Effects of cognitive appraisal and autonomy on job crafting to change one's work demands

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Acknowledgement: This study was supported by Australian Research Council Australian Laureate Fellowship (Grant Number: FL160100033), Australian Government Research Training Program (RTP) Scholarship, Curtin International Postgraduate Research Scholarship (CIPRS), and Research Stipend Scholarship.

Manuscript accepted for publication in

European Journal of Work and Organizational Psychology

Please cite this article as: Zhang, F., & Parker, S. K. (2022). Reducing demands or optimizing demands? Effects of cognitive appraisal and autonomy on job crafting to change one's work demands. *European Journal of Work and Organizational Psychology*. https://doi:10.1080/1359432X.2022.2032665

Abstract

Employees can craft their job demands by optimizing or reducing them. Research has shown reducing demands produces dysfunctional effects, yet optimizing demands creates positive effects. However, little is known about when and why employees choose to engage in optimizing demands versus reducing demands. Drawing on the transactional theory of stress, we proposed that individuals' primary appraisal of a demand as a challenge or a hindrance affects their choice of demands crafting via secondary appraisal of control. We further theorized that job autonomy affects control appraisal and interacts with primary appraisal to affect control appraisal. We conducted two randomized vignette experiments in which we manipulated primary appraisal and job autonomy in Study A (N = 182) and control appraisal in Study B (N = 145) to test our hypotheses. The assigned challenge appraisal positively predicted optimizing demands indirectly via the increased control appraisal. The assigned hindrance appraisal positively predicted reducing demands, but this effect was not mediated by control appraisal. Job autonomy had a main effect on control appraisal but did not interact with assigned challenge/hindrance appraisal in predicting control appraisal. Our findings provide significant insights into distinct mechanisms of two demands crafting strategies, and guidance to organizational practices.

Keywords: job crafting, optimizing demands, reducing demands, challenge appraisal, hindrance appraisal, job autonomy

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Job crafting is defined as the self-initiated behaviours of employees to change the level of their job resources and job demands so as to better align the job with their abilities, needs, and preferences (Tims et al., 2012). A great deal of research has consistently shown the positive effects of crafting to increase one's job resources and job challenges (see Lichtenthaler & Fischbach, 2019; Rudolph et al., 2017 for meta-analyses). However, there have been mixed findings on the outcomes of job crafting to change one's job demands, which might reflect the type of demands-oriented job crafting involved. Specifically, researchers have proposed two job crafting strategies pertinent to job demands: *job crafting to reduce demands* (*reducing demands*, Tims et al., 2012; Petrou et al., 2012) in which people avoid or reduce demanding tasks and relationships, and *job crafting to optimize demands* (*optimizing demands*, Demerouti & Peeters, 2018) in which crafters simplify or optimize work methods or processes to improve work efficiency and thereby lower their experienced demands. Optimizing demands and reducing demands both aim to modify job demands, but they are conceptually and empirically distinct, with different outcomes.

Optimizing demands, which involves effortful and directed actions to improve the work environment, is regarded as an approach-oriented proactive behaviour, while reducing demands, which involves directed actions to escape from a demanding situation, is similar to avoidance-oriented withdrawal behaviours (Demerouti & Peeters, 2018; Zhang & Parker, 2019). Research has shown that reducing demands is negatively related to desirable outcomes (Lichtenthaler & Fischbach, 2019; Rudolph et al., 2017), while optimizing demands is positively related to work engagement (Demerouti & Peeters, 2018). Nevertheless, to date, little is known about when and why employees adopt these demands crafting approaches. The aim of this paper is to theorize and

investigate the processes through which job demands are associated with these two distinct demands crafting strategies.

The challenge-hindrance demands framework (e.g., LePine et al., 2005) has been dominant in the job demands literature. Challenge demands (e.g., workload, time pressure) are demands that require effort yet create opportunities for learning and achievement, while hindrance demands (e.g., role conflict) are demands that thwart personal goals and achievement (LePine et al., 2005). However, a priori categorizations of job demands have been criticized as overly simplistic and not consistent between persons (e.g., Searle & Auton, 2015; Webster et al., 2011). Based on their meta-analysis of the outcomes of challenge and hindrance demands, Mazzola and Disselhorst (2019) proposed that research should focus on the individuals' specific appraisals of job demands and avoid the a priori categorization of job demands. We adopt this perspective that advocates for the importance of demands appraisal and draw on the transactional theory of stress (Lazarus & Folkman, 1984) to develop our hypotheses. According to this theory, a job demand can be appraised as either a challenge or hindrance, which in turn affects the behavioural strategies one will use (Lazarus & Folkman, 1984). We extend this theorizing to investigate the role of challenge/hindrance appraisal in influencing the choice of demands crafting strategies.

We then go further to assess the mechanism between individuals' appraisals and demands crafting. In the appraisal process, individuals' primary appraisals of demands (that is, as a challenge or hindrance) are followed by a secondary appraisal (i.e., control appraisal) that involves judgements about available coping resources and hence the degree of control individuals perceive they have. In turn, control appraisal determines behavioural responses (Chang, 1998). Therefore, we theorize that challenge or hindrance appraisal (a primary appraisal) affects demands crafting indirectly via control appraisal (a secondary appraisal).

Finally, we investigate the boundary condition that influences how challenge/hindrance appraisal is associated with control appraisal. Research suggests that one's control appraisal is not only affected by individuals' challenge or hindrance appraisal, but also by their available job resources in the situation (Mackey & Perrewé, 2014). Thus, we investigate the effect of job autonomy, one important job resource, in shaping an individual's control appraisal. Specifically, we theorize that job autonomy can influence control appraisal directly and moderate the relationship between challenge/hindrance appraisal and control appraisal. Our hypothesized theoretical model is presented in Figure 1.

Our article contributes to the literature in several ways. First, we address scholars' call for research to better understand demands crafting (Rudolph et al., 2017, Zhang & Parker, 2019). We investigate the antecedents of two distinct demands crafting strategies, which is currently lacking in job crafting literature. This is important to provide integrated findings about demands crafting, given the very diverse consequences of optimizing demands versus reducing demands.

Second, we contribute to a better understanding of the demands-appraisal-crafting process, responding to the call to investigate the mechanisms of job crafting (Zhang & Parker, 2019). This is important to build and extend job crafting theory on when and why individuals adopt different demands crafting approaches. Theoretically, our research also contributes to the transactional theory of stress (Lazarus & Folkman, 1984) by including both a primary appraisal process and a secondary appraisal process. The secondary appraisal (i.e., control appraisal) plays an important and possibly greater role in affecting behavioural responses (Chang, 1998), but this has been rarely explored to date in research into the demands-coping process.

Finally, from a methodological perspective, we offer a strong empirical foundation by using a randomized experimental research design, which allows for stronger causal conclusions. As

individuals' challenge/hindrance appraisal and control appraisal are likely to be associated with factors (e.g., self-efficacy, approach-avoidance orientation) that are antecedents of demands crafting (Mackey & Perrewé, 2014), field studies could suffer from the endogeneity problem (Antonakis et al., 2010). A randomized experimental design can ensure that the changes in demands crafting stem from no other cause than the manipulated variables. Moreover, as we investigate the mediation process, following a recommendation for experimental tests of mediation models (Stone-Romero & Rosopa, 2011), we conduct two randomized experiments to manipulate the causal predictor (i.e., challenge vs. hindrance appraisal) and the mediator (i.e., control appraisal), separately, which offers a solid basis for causal inferences about the primary appraisal (X) in relation to control appraisal (M) and, in turn, control appraisal's effect on demands crafting (Y).

Theory and Hypotheses

In the following section, we draw on the transactional theory of stress (Lazarus & Folkman, 1984) to propose the processes through which individuals' cognitive appraisals of job demands are associated with the two distinct demands crafting strategies.

Primary Appraisal of Challenge versus Hindrance and Demands Crafting

It was established decades ago that there are two fundamental dimensions of appraisal: *primary appraisal* and *secondary appraisal* (Lazarus and Folkman, 1984). Primary appraisal refers to the evaluation of whether and how an encounter will affect one's well-being. Focusing on the primary appraisal of potentially demanding situations, a *challenge appraisal* refers to perceiving the situation as having the possibility for gain and growth, whereas a *hindrance appraisal* or *threat appraisal* refers to evaluating the situation as having the potential for harm and loss.

As a challenge appraisal indicates a potential gain for personal goals and development, individuals anticipate that their investment in time and energy in addressing a situation will be rewarded. Thus, appraising a job demand as a challenge will motivate individuals to invest their time and effort to achieve the expected positive outcomes (LePine et al., 2016). Moreover, employees who appraise job demands as challenges tend to experience positive affect such as excitement, hope and eagerness (Skinner & Brewer, 2002), which, in turn, can promote individuals' confidence and energy to address the demands (Baron, 1990). Supporting the above reasoning, in empirical studies, researchers have found that challenge appraisals are related to positive affect and attitudes (Prem et al., 2017; Webster et al., 2011), more problem-focused coping (Gardner & Fletcher, 2009), and proactive behaviours (Ohly & Fritz, 2010). Consistent with previous research, which has indicated that challenge appraisals can activate more approach-oriented goals and behaviours, we hypothesize that, when job demands are appraised as challenges, employees are more likely to craft job demands using an approach-oriented strategy.

Hypothesis 1a: Challenge appraisals of job demands will positively predict optimizing demands crafting.

In contrast, as a hindrance appraisal indicates a potential loss for personal goals, employees who appraise job demands as hindrances are likely to experience fear and anxiety (Searle & Auton, 2015; Skinner & Brewer, 2002), which motivates these individuals to move away from the threat and its related consequences (Rodell & Judge, 2009; Roth & Cohen, 1986). Thus, employees who perceive job demands as hindrances are likely to cope with the demanding situations more passively. Indeed, Blascovich et al. (2004) found that employees who perceive a demanding situation as a hindrance put less effort into the task at hand and performed worse than those who have a challenge appraisal. In several other studies, it has also been shown that a

hindrance appraisal is related to negative affect and attitudes, more emotion-focused coping, and withdrawal behaviours (Gardner & Fletcher, 2009; Webster et al., 2011). Consequently, we argue that employees with a hindrance appraisal will be likely to withdraw from their tasks and environment during demands crafting.

Hypothesis 1b: Hindrance appraisals of job demands will positively predict reducing demands crafting.

Secondary Appraisal of Perceived Control

Secondary appraisal is the evaluation of coping resources and options which determines how much control an individual perceives they have over an encounter (Lazarus & Folkman, 1984). In this article, we use control appraisal as our indicator of secondary appraisal. The concept of control appraisal is different from the concept of job autonomy or job control; the latter reflects "the extent to which a job allows freedom, independence, and discretion to schedule work, make decisions, and choose the methods used to perform tasks" (Morgeson & Humphrey, 2006, p. 1323). However, control appraisal is the extent of perceived control over a situation after the evaluation of available coping resources and options (Lazarus & Folkman, 1984). Job autonomy is thus a job resource, or an attribute of the job that helps one to achieve one's goals, whereas control appraisal is an evaluation of one's sense of control over a situation.

Theoretically, primary appraisal is logically followed by secondary appraisal, which, in turn, leads to subsequent coping responses (Chang, 1998). As already argued, challenge and hindrance appraisals are accompanied by distinct affective states. The positive affect that individuals experience when they have a challenge appraisal enables them to organize information more inclusively (Isen & Daubman, 1984), which helps a thorough evaluation of the situation and available resources. Hence, individuals with a challenge appraisal are likely to appraise the

demand as one they can more readily control. In contrast, individuals who perceive a demanding situation as a hindrance may ignore the potential resources as the negative affect that they experience restricts their attention and information processing (Isen & Daubman, 1984), which, in turn, reduces the extent to which they appraise the demand as being controllable. Our hypotheses are:

Hypothesis 2a: A challenge appraisal will positively predict one's control appraisal.

Hypothesis 2b: A hindrance appraisal will negatively predict one's control appraisal.

Research has shown that control appraisal affects subsequent coping actions (Chang, 1998). When individuals perceive high control over a demanding situation, they will be more confident that they can change that situation, and hence it is more likely they will engage in problem-focused or approach-oriented coping (Chang, 1998; Folkman & Lazarus, 1985). Conversely, when individuals perceive little control over a demanding situation, this is likely to result in emotion-focused or avoidance coping (Chang, 1998; Folkman & Lazarus, 1985). Consistent with prior theory and empirical research, we therefore argue that employees with a high perception of control are likely to craft their job demands via approach-oriented crafting rather than avoidance-oriented coping.

Hypothesis 3a: Control appraisal will positively predict optimizing demands.

Hypothesis 3b: Control appraisal will negatively predict reducing demands.

Taken together, following the process of primary appraisal, secondary (i.e., control) appraisal and coping according to the transactional stress and coping model, we propose a mediation model in which control appraisal mediates the relationship between primary appraisal (challenge versus hindrance) and demands crafting. Specifically, when individuals appraise a job demand as a challenge, they will perceive more control over this demanding situation, which, in

turn, leads to greater use of optimizing demands. Conversely, when individuals appraise a job demand as a hindrance, they will perceive less control over the demanding situation, which, in turn, leads to greater use of reducing demands.

Hypothesis 4a: A challenge appraisal will predict more optimizing demands indirectly through increased control appraisal.

Hypothesis 4b: A hindrance appraisal will predict more reducing demands indirectly through decreased control appraisal.

Job Autonomy, Control Appraisal and Demands Crafting

The extent to which an individual perceives control over a demanding situation is affected by primary appraisal, as hypothesized above, as well as situational factors (Mackey & Perrewé, 2014). Regarding the latter, we focus on a key situational factor in this research: job autonomy. We choose job autonomy for two main reasons. First, job autonomy is one of the most important predictors of job crafting as it affects individuals' perceived opportunity to alter their job (Wrzesniewski & Dutton, 2001). Second, as indicated in the definition, job autonomy is closely related to individuals' control appraisal. Job autonomy enables employees to decide their timing of tasks, schedule of tasks, and work methods, and consequently it should increase employees' appraised control. Consistent with this reasoning, Thompson and Prottas (2006) found a positive relationship between job autonomy and perceived control. We therefore hypothesize that:

Hypothesis 5: Job autonomy will positively predict control appraisal.

Job resources may play distinct moderating effects in the relationship between job demands and outcomes depending on whether the demands are challenging or hindering (Tadić et al., 2015). Specifically, drawing on job demands-resources theory, Tadić et al. (2015) found that job resources acted as buffers to weaken the negative effects of hindrance demands but played as

motivators to foster the positive effects of challenging demands (Tadić et al., 2015). Similarly, considering individuals' appraisal of job demands, we argue that the effect of challenge or hindrance appraisal on control appraisal may vary, depending on the level of job autonomy. When people have made a primary appraisal (i.e., whether the demand is a hindrance or challenge), they then evaluate their available resources to cope with the job demand (Lazarus & Folkman, 1984). When someone perceives a job demand as a challenge, a high level of job autonomy enables the individual to mobilize available resources and change the environment (Tims et al., 2012, Thompson & Prottas, 2006), leading to an even higher sense of control. In contrast, when someone judges a job demand as a hindrance, an environment in which this person has limited job autonomy will hinder their energy to explore the potential resources to help them cope (Thompson & Prottas, 2006; Wrzesniewski & Dutton, 2001), resulting in an even more impaired sense of control. Therefore, we hypothesize that:

Hypothesis 6a: The positive effect of a challenge appraisal on control appraisal will be stronger when job autonomy is higher rather than lower.

Hypothesis 6b: The negative effect of a hindrance appraisal on control appraisal will be stronger when job autonomy is lower rather than higher.

Methods

Research Approach

To test the hypotheses, we conducted two randomized vignette experiments (Study A and Study B) following a recommendation on the experimental testing of mediation models (Stone-Romero & Rosopa, 2011). We focused on workload as the indicator of job demands as it is more neutral than some other demands, thus it can be equally appraised as a challenge or a hindrance (Webster et al., 2011). This created an appropriate context to manipulate participants' challenge

and hindrance appraisal.

We adopted an experimental design to test the hypothesized model for two important reasons. First, in real work settings, perceptions of job demands are usually affected by factors such as individual differences and job resources, meaning that the assessment of the degree of demands is likely to be entangled to some degree with both these. Our vignette experiments address this limitation by keeping the job demands constant across conditions. Second, it is difficult, if not impossible, to disentangle primary appraisal from secondary appraisal using a survey design. For example, the challenge or hindrance appraisal of a job demand measured in a survey may be affected by how much control individuals have over the situation, which results in a confounding of primary appraisal and control appraisal. Using an experimental design, however, we were able to manipulate primary appraisal and secondary appraisal separately. Henceforth, we refer to assigned appraisals (e.g., assigned challenge appraisal or hindrance appraisal) when referring to the variables in our experiments.

In Study A, we manipulated participants' primary appraisal of demands, as well as their level of job autonomy to test the mediation model and moderated mediation model (H1-H6). In Study B, we manipulated participants' control appraisal to test its causal effect on demands crafting (H3). By integrating causal correlations obtained from the two experiments (r_{XM} and r_{XY} in Study A and r_{MY} in Study B), we were able to test the causal indirect effect of challenge/hindrance appraisal on demands crafting via control appraisal (H4).

The two experimental studies were approved by the Human Research Ethics Committee of Curtin University in Australia (HREC approval number HRE2018-0452 and HRE2020-0606). All data are available in anonymised form on the Open Science Framework (https://osf.io/ajwgd/?view_only=15a7c8f483ae4dbbb8820b46f826d412).

Sample

We conducted prior power analyses using G*Power 3.1 (Faul et al., 2009) to calculate the required sample size for each study (see online supplement S.1). These were N = 171 for Study A and N = 138 for Study B. We then recruited full-time working professionals through TurkPrime (Litman et al., 2017) and Prolific.co (Palan & Schitter, 2018) to achieve the desired sample size. We used pre-screening procedures to select an appropriate subject pool and ensure high-quality responses (Litman et al., 2017). The pre-screening criteria for MTurk were occupational status: employee, hours employed 35+ hours per week, nationality: US, number of HITs approved: 100+, approval rate: 99%+. The pre-screening criteria for Prolific were occupational status: full-time employee, nationality: US, approval rate: 99%+. The available participant pool in MTurk was N = 522, while in Prolific it was N = 10,289. Only participants who meet the pre-screening criteria could access our studies. In addition, we asked the pre-screening questions at the beginning of our studies to double check: we included a Captcha verification question supported by Qualtrics to identify bots; and we asked two questions about the scenario to make sure the participants read the material carefully. If participants did not pass any of above checks, they were not allowed to continue. To ensure data quality, we also included two additional instructed-response attention check items (Kung et al., 2018). Participants who did not pass the two attention checks were deleted for data analysis.

Participants on MTurk were paid USD 2.00 for their participation of approximately 15 minutes (USD 8.00/h), higher than the minimum wage (USD 7.25/h). Participants on Prolific were paid GBP 1.00 for their participation of approximately 8 minutes (GBP 7.50/h), higher than the minimum wage (GBP 5.00/h).

182 participants met data quality requirements in Study A (out of 200 recruited

participants). Just under half (43%) of participants were male. The average age was 40.29 years (SD = 10.65). On average, participants' total work experience was 17.43 years (SD = 14.54), and average working hours per week were 41.58 hours (SD = 6.37). The final sample size for Study B was 145 (out of 150 recruited participants). Just over half (58%) of participants were male. The average age was 34.13 years (SD = 9.10). On average, participants' total work experience was 12.71 years (SD = 9.19), and the average working hours per week was 41.22 hours (SD = 5.71)[1].

Procedure

Participants accessed an external link to participate in the studies, which were both set up on the Qualtrics survey platform. At the beginning of each study, we provided information about the research such as human ethics approval, aims, and requirements. Participants were guaranteed anonymity and the right to opt out at any time. Consent was asked before starting the studies.

In Study A, participants were asked to read a scenario in which they were software developers in a software development company, wherein they were facing a high workload (see Appendix 1). Participants then were randomly assigned to two manipulated conditions (challenge appraisal vs. hindrance appraisal), which instructed them to appraise their designated workload as a challenge or a hindrance. After completing the appraisal manipulation checks, participants then were randomly assigned to two job autonomy conditions (high vs. low). Participants then completed the job autonomy manipulation checks, measures of control appraisal, reducing demands, optimizing demands, and demographics. In Study B, participants were asked to read the same scenario and then were randomly assigned to two manipulated control appraisal conditions (high vs. low). Participants then completed the control appraisal manipulation check, measures of

[1] There was a significant difference in gender between two studies, $\chi 2(1) = 7.34$, $p = .007$. Participants in Study A were older than those in Study B, $t(322) = 5.50$, $p < .001$. Participants in Study A also had longer work experience than those in Study B, $t(321) = 4.11$, $p < .001$. There were no significant differences in participants' weekly work hours, $t(325) = .53$, $p = .60$, and in participants' self-efficacy, $t(324) = -.59$, $p = .56$. The results did not change with inclusion or exclusion of these demographics. Thus, demographics were excluded from analyses for parsimony.

reducing demands, optimizing demands, and demographics. The procedures for Study A and Study B are presented in Figure 2 and Figure 3, respectively. For both studies, we used the web service function in Qualtrics which generated two random parameters and then randomly assigned participants to different experiment conditions.

To check the validity of the scenario, we measured workload in each study. Results showed that participants perceived a high workload (4.77 ± 0.37 in Study A, 4.66 ± 0.57 in Study B). We also assessed whether the scenarios were perceived to be realistic (5.83 ± 0.95 in Study A, 6.32 ± 0.94 in Study B) and were easy to imagine (6.44 ± 0.69 in Study A, 6.08 ± 1.22 in Study B). These were rated on a 7-point Likert scale from completely disagree to completely agree. The items were "It is realistic that I might experience a high workload situation in my work" and "It is easy for me to imagine myself working in a high workload situation like in the scenario". As shown in the mean ratings above, the data indicated high levels of realism and ease of imagining. Additionally, we asked participants' experience in dealing with high workload situation in their jobs. 96.7% of participants in Study A and 93.8% of participants in Study B experienced high workload situation in their jobs. There was no statistical significance in participants' experience in dealing with high workload, $\chi^2(1) = 1.56$, $p = .21$. The above evidence showed a good generalizability of the hypothetical scenario to individuals' real work experience.

Experimental Manipulations

Primary appraisal manipulation. Participants were instructed to read one of two articles about workload which were written by the authors. The articles were written in the same style and had the same structure and length (around 200 words). To make the message credible, we summarized what the alleged research has shown concerning the effects of a high workload (see Appendix 2). The article for the participants in the assigned challenge appraisal condition stated

the negative effects of a low workload and the positive effects of a high workload. The article for the participants in the assigned hindrance appraisal condition described the negative effects of a high workload and the positive effects of a low workload. This manipulation was effective (see manipulation check results in online supplement Appendix 2).

Job autonomy manipulation. Participants were instructed to read one of two materials on their job autonomy which were written by the authors (see Appendix 3). We included three types of job autonomy in the material: work scheduling autonomy, work methods autonomy and decision-making autonomy (Morgeson & Humphrey, 2006). In the high autonomy condition, the material stated that participants can decide the schedule and methods that suit them best in their job, and they can make decisions over various issues. In the low autonomy condition, the material stated that participants' schedule and methods were constrained by the company, and they cannot change this by themselves, nor can they make their own decisions. This manipulation was effective (see manipulation check results in Appendix 3).

Control appraisal manipulation. Participants were instructed to read one of two materials on their perceived control over the situation written by the authors (see Appendix 4). In the condition of high control appraisal condition, the material stated that participants were able to make changes at work and had a feeling that the situation was manageable and under their control. In the low control appraisal condition, the material stated that participants were not able to make changes at work and had a feeling that the situation was not manageable and beyond their control. This manipulation was effective (see manipulation check results in Appendix 4).

Measures

All measures used a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree).

Reducing demands. To suit the experiment scenarios, four items adapted from the measure

of decreasing hindering demands (Tims et al., 2012) were used (α = .78 in Study A and .81 in Study B). Participants were asked to imagine themselves in the scenario, and to indicate how they would behave. The items included: “I will reduce some tasks to make my workload manageable”, “I will skip some tasks that I think are not very important”, “I will avoid bothersome tasks involved in my work”, and “I will find ways to bypass time-consuming tasks”.

Optimizing demands. The optimizing demands construct was measured with four items developed by Demerouti and Peeters (2018) (α = .77 in Study A and .79 in Study B). The items are “I will come up with solutions to accomplish my work in an easier way”, “I will try to improve work processes or procedures to make my job easier”, “I will look for ways to do my work more efficiently”, and “I will change work processes or procedures that delay my work”.

Challenge and hindrance appraisal (used for manipulation check). Appraisals about the workload were assessed with a measure developed by Searle and Auton (2015), including challenge appraisal (4 items, e.g., “The high workload will help me to learn a lot in my job”; α = .93) and hindrance appraisal (4 items, e.g., “The high workload will hinder any achievements I might have”; α = .94).

Job autonomy (used for manipulation check). Job autonomy was assessed with three items measuring work scheduling autonomy, work method autonomy, and decision-making autonomy, respectively (Morgeson & Humphrey, 2006, α = .98). The items are “The job allows me to make my own decisions about how to schedule my work”, “The job allows me to make decisions about what methods I use to complete my work”, and “The job provides me with significant autonomy in making decisions”.

Control appraisal. Control appraisal was measured with four self-developed items (α = .82 in Study A and .96 in Study B). Items are “I can manage the demands imposed on me by the

increased workload", "I can change or do something about this situation", "I am able to cope with the increased workload", and "I have the ability to do well in this tough situation".

Workload (used for scenario validity check). Workload was measured with four items taken from Janssen (2001) (α = .77 in Study A and .84 in Study B). Items are "I have to work fast", "I have too much work to do", "I have to deal with a backlog at work", and "I can do my work in comfort" (reverse-coded).

Results

Preliminary Analysis

To examine whether self-reported variables in Study A and Study B were distinctive, we conducted confirmatory factor analysis (CFA) using MPlus 8.1. As presented in Table 1, the CFA results showed that the proposed three-factor model (i.e., control appraisal, optimizing demands, and reducing demands) in Study A (χ^2/df = 1.79, RMSEA = .07, CFI = .95, TLI = .93, SRMR = .07) fitted better than the two-factor model ($\Delta\chi^2$ (2) = 175.99, $p < .001$) and one-factor model ($\Delta\chi^2$ (3) = 350.75, $p < .001$). The proposed two-factor model (i.e., optimizing demands and reducing demands) in Study B fitted better than the one-factor model: χ^2/df = 1.02, RMSEA = .01, CFI = .99, TLI = .99, SRMR = .04, $\Delta\chi^2$ (1) = 196.98, $p < .001$.

Testing Hypotheses in Study A

We conducted path analysis using ML estimator with MPlus 8.1 to test a mediation model and a moderated mediation model in Study A. To investigate the indirect effect of challenge or hindrance condition (primary appraisal) on demands crafting through control appraisal, we used bootstrap estimates with 10,000 iterations and a bias-corrected confidence interval (95%) (Preacher & Hayes, 2008).

We theoretically hypothesized the direct effect from primary appraisal to job crafting.

Following the recommended practice in testing mediation (Aguinis et al., 2017; James et al., 2006), we compared the hypothesized model with three other alternative models, omitting the direct effect. As shown in Table 2, Model 1, which omits the direct effect from primary appraisal to optimizing demands, fitted the data best (AIC = 1245.6, RMSEA = .06, CFI = .99, TLI = .94, SRMR = .02). Thus, we chose Model 1 as our final model for parsimony.

We presented the mediation results for both the theorized model and the final model in Table 3. In the theorized model, primary appraisal was not significantly related to optimizing demands, which did not support Hypothesis 1a. We then report results for the final model excluding the path from primary appraisal to optimizing demands. As shown in Table 3, primary appraisal was negatively related to reducing demands (β = -.15, *SE* = .07, p = .048), supporting Hypothesis 1b. Primary appraisal was positively related to control appraisal (β = .36, *SE* = .07, p < .001) supporting H2a and H2b. Control appraisal was positively related to optimizing demands (β = .37, *SE* = .08, p < .001) but was not significantly related to reducing demands (β = -.11, *SE* = .09, p = .23), which supported H3a but did not support H3b. The indirect effect of primary appraisal on optimizing demands through control appraisal was significant (β = .18, *SE* = .05, 95% CI = [.09, .29]), supporting H4a. However, there was no significant indirect effect of primary appraisal on reducing demands through control appraisal (β = -.07, *SE* = .06, 95% CI = [-.18, .05]), which did not support H4b.

We then tested the moderating effect of job autonomy based on the final mediation model which omits the direct effect from primary appraisal to optimizing demands. The moderated mediation model fitted the data well (RMSEA = .00, CFI = 1.00, TLI = 1.00, SRMR = .03). As shown in Table 4, job autonomy was positively related to control appraisal (β = .42, *SE* = .08, p < .001), supporting H5. However, the interaction term of primary appraisal and job autonomy was

not significant (β = -.07, *SE* = .12, *p* = .56), which did not support H6. Moreover, as shown in Table 5, the indirect effect of primary appraisal on optimizing demands through control appraisal was significant when job autonomy was low (β = .19, *SE* = .07, 95% CI = [.07, .33]) and high (β = .15, *SE* = .04, 95% CI = [.07, .24]). There was no significant indirect effect of primary appraisal on reducing demands through control appraisal when job autonomy was low (β = -.08, *SE* = .07, 95% CI = [-.22, .07]) and high (β = -.06, *SE* = .05, 95% CI = [-.17, .05]). Thus, job autonomy did not moderate the indirect effect of primary appraisal on optimizing demands and reducing demands via control appraisal.

Testing the Causal Effect of Control Appraisal in Study B

To test H3 in Study B, we ran two independent-samples t-tests in SPSS 26.0 to compare the differences in reducing demands and optimizing demands. A significant difference was found in optimizing demands as a function of control appraisal, t (143) = 3.85, $p < .001$, Hedges' g = 0.64. Specifically, participants in high control appraisal condition (4.49±0.55, N = 70) reported higher optimizing demands than those in low control appraisal condition (4.15±0.51, N = 75), supporting H3a. There was no significant difference in reducing demands, t (143) = -.60, p = .55, Hedges' g = 0.11, which did not support H3b.

Testing the Mediation Model Based on Two Experiments

To test the causal indirect effect, we conducted a path analysis using ML estimator in MPlus 8.1 with data from both studies. We used the online interactive tool developed by Selig and Preacher (2008) which adopts a Monte Carlo simulation procedure with 20,000 replications to estimate the confidence interval of the indirect effects.

For testing mediation in two randomized experiment design, we used the recommended statistical strategy of point-biserial correlation coefficients obtained from the two experiments

(Stone-Romero & Rosopa, 2011). Specifically, r_{XM} and r_{XY} (i.e., correlations of primary appraisal with control appraisal and demands crafting) were obtained from Study A, while r_{MY} (correlations of control appraisal with demands crafting) was obtained from Study B (see online supplement S.2). Due to the unequal distribution of control appraisal in these two studies, we corrected r_{MY} following the instruction of Stone-Romero and Rosopa (2011) (see online supplement S.3). Correlations used for the mediation analysis are presented in online supplement S.4.

As shown in Table 2, the mediation model omitting the path from primary appraisal to optimizing demands fitted the data best (RMSEA = .00, CFI = 1.00, TLI = 1.00, SRMR = .01). As shown in Table 3, the path analysis results based on corrected correlations were consistent with findings in Study A. A Monte Carlo simulation showed a significant indirect effect of primary appraisal on optimizing demands via control appraisal (β = .09, *SE* = .04, *p* = .02, 95% CI = [.04, .18]) and a non-significant indirect effect on reducing demands via control appraisal (β = .02, *SE* = .03, *p* = .65, 95% CI = [-.08, .05]). Thus, H4a was supported but H4b was not supported.

Overall, as shown by the summary of findings of the two experiments in Table 6, assigned challenge appraisal predicted greater use of optimizing demands only indirectly, via increased control appraisal but without a significant direct effect. Assigned hindrance appraisal directly predicted greater use of reducing demands, but without a significant indirect effect, via control appraisal. Job autonomy predicted higher control appraisal but did not moderate the effect of primary appraisal on control appraisal.

Additional Exploratory Analysis

Besides job resources, personal resources are also important in the appraisal process (Mackey & Perrewé, 2014). For example, when one perceives a job demand as a challenge, with high level self-efficacy, one is likely to feel more confident to deal with the job demand, and

hence experience a higher sense of control over the job demand. In our study, we measured self-efficacy as a control variable to ensure the robustness of our findings. Self-efficacy was assessed by the 8-item General Self-Efficacy Scale developed by Chen et al. (2001) ($\alpha = .94$, an example item is "I am confident that I can perform effectively on many different tasks"). The independent-samples t-test analyses showed no significant differences in self-efficacy between the different experimental conditions. Furthermore, to explore the possible moderating effect of self-efficacy on the relationship between primary appraisal and control appraisal, we tested a moderated mediation model ($\chi^2 = 8.38$, df = 13, RMSEA = .00, CFI = 1.00, TLI = 1.00, SRMR = .03) with all two-way interactions (appraisal × job autonomy, appraisal × self-efficacy, and job autonomy × self-efficacy) and a three-way interaction (appraisal × job autonomy × self-efficacy). Although self-efficacy was positively related to control appraisal ($\beta = .39$, $SE = .13$, $p = .004$), all interaction effects were non-significant. Thus, self-efficacy was not found to moderate the relationship between primary appraisal and control appraisal.

Discussion

Our study makes several significant theoretical contributions. First, we help understand what drives individuals to craft their job demands in very different ways. Previously researchers have investigated antecedents of reducing demands (e.g., proactive personality, self-efficacy, see Rudolph et al., 2017). However, there has been little research on the antecedents of optimizing demands. Both reducing demands and optimizing demands are job crafting strategies to change job demands, but they have negative and positive outcomes, respectively. Thus, it is of theoretical significance to include the two demands crafting variables in one study to provide insights into what drives one versus the other. We drew on the transactional theory of stress (Lazarus & Folkman, 1984) to propose, test, and show that individuals' choice of job demands crafting is

shaped not by the demands themselves, but by their cognitive appraisals about those demands.

Second, we contribute to job crafting theories and stress theories by showing different processes through which individuals' assigned challenge or hindrance appraisals led to optimizing demands or reducing demands. From the transactional theory of stress (Lazarus & Folkman, 1984), primary appraisal could affect job crafting behaviour both directly and indirectly through control appraisal. However, we found that assigned challenge appraisal predicted optimizing demands only indirectly by increasing control appraisal, whereas assigned hindrance appraisal predicted reducing demands directly with no indirect effect via control appraisal. Our findings thus support the distinctiveness of reducing demands and optimizing demands that has been emphasized by job crafting scholars (Demerouti & Peeters, 2018; Zhang & Parker, 2019), but additionally show how appraisals differentially affect these behaviours.

Research in proactive behaviour has identified three proactive motivational states, "can do", "reason to" and "energized to", that drive proactive action (Parker et al., 2010). A challenge appraisal can be seen to involve "reason to" and "energized to" forms of motivation because this type of appraisal indicates the potential gain (which is the reason) and stimulates positive affect (which provides energy for individuals to engage in proactive behaviour). However, "can do" motivation, which involves the evaluation of the costs of an action, the abilities, and resources to undertake an action, is also important (Parker et al., 2010). Again, this is supported within the transactional theory of stress as the "can do" motivation is relevant to control appraisal (Lazarus & Folkman, 1984). Our findings showed that a challenge appraisal needs to translate into a perceived sense of control, similar to the "can do" motivation, to predict optimizing demands.

Conversely, against the transactional theory of stress which indicates a negative relationship between control appraisal and avoidance behaviours (Chang, 1998; Folkman & Lazarus, 1985),

control appraisal did not affect reducing demands. Our findings suggest that employees engage in reducing demands not because they lack a sense of control over the situation but because of their hindrance perception of the situation. Specifically, when a demanding situation is appraised as a hindrance, it stimulates a motivational state of avoidance which directly inhibits individuals' motivation to explore coping resources, leading to avoidance-oriented response (that is, reducing demands crafting).

This research also contributes to the transactional theory of stress (Lazarus & Folkman, 1984) by showing the distinct roles of primary appraisal and secondary appraisal and their relative importance in predicting individuals' job crafting actions. Although frequently theorized, empirical studies focused on separating these appraisals are rare.

We did not find any moderating effect of job autonomy on the relationship between primary appraisal and control appraisal. This may be explained by trait activation theory which indicates that situation strength is likely to affect the effect of individual differences on behaviours (Tett & Burnett, 2003). When employees are in a highly autonomous job, they tend to have a high sense of control, thus limiting the effect of their challenge appraisal on control appraisal. From trait activation theory, the effect of individuals' challenge appraisal will be salient in a situation wherein job autonomy is low. This is contradictory to our final pair of hypotheses that high job autonomy will strengthen the positive effect of challenge appraisal and vice versa, so the two contradictory moderating effects might cancel out each other.

Finally, from a methodological perspective, we provided experiment-based empirical findings, which is important to build a credible job crafting theory that explains why individuals craft their job demands in very different ways. The strategy of one randomized experiment has been predominantly used to address the mediation process (Stone-Romero & Rosopa, 2011).

However, as the mediator is not randomly manipulated, the test of mediation can lead to ambiguity. This type of design could support several competing models a) X → M → Y, b) X → Y → M, c) X → M, M → Y, but no mediation effect (Stone-Romero & Rosopa, 2011). Although statistical analyses could be used to compare these models, no causal conclusion on mediation could be obtained. However, in our study we used the strategy of two randomized experiments, in which we manipulated the independent variable and mediator separately. Thus, we were able to draw causal conclusions on the mediation process.

Practical Implications

Understanding the processes that shape demands crafting can provide important information for organizations to guide and manage employees' crafting behaviours. Optimizing demands is a more favourable job crafting strategy than reducing demands. To promote more optimizing demands strategies, the key is to enhance employees' challenge appraisal and their control appraisal over the demands. As reducing demands is mainly affected by hindrance appraisal, the best way to lower the extent to which employees engage in reducing demands is to avoid a hindrance appraisal to a job demand.

Research has shown that individuals' cognitive appraisal can be influenced by providing informational support, a specific form of social support (van Steenbergen et al., 2008). The aim of informational support is to provide individuals with opportunities to have a thorough understanding of an ongoing or upcoming situation, to discuss and compare their appraisals with those of others. By doing this, individuals can examine whether their appraisals and emotional responses are appropriate and therefore perhaps form new interpretations of the situation (van Steenbergen et al., 2008). The primary appraisal manipulation we used in Study A is based on the informational support strategy, in which we provided a scenario emphasizing the potential gains

and benefits of a high workload to promote an appraisal of this high workload as a challenge.

In addition, as control appraisal can predict the use of optimizing demands, strategies that can enhance one's sense of control will also increase the use of optimizing demands. For example, organizations should offer job resources such as job autonomy to employees, which enables their sense of control and hence greater use of optimizing demands. In the case of hindrance appraisal, offering job autonomy might be ineffective as employees lack the motivation to mobilize their autonomy.

Lastly, it should be noted that organizations should keep job demands at a reasonable level for employees. If the job demands exceed the capacity of employees, forcing employees to form challenge appraisals towards job demands might be unsuccessful and detrimental to employees' motivation and health (Mazzola & Disselhorst, 2019; Tadić et al., 2015).

Limitations and Implications for Future Research

Notwithstanding the strengths of our research, the two studies presented here also have several limitations. First, as we manipulated these appraisals, individuals' primary appraisals of challenge or hindrance to the demand were assigned rather than naturally captured. This should be taken into consideration when interpreting our findings. Moreover, as the experimental studies were conducted in a controlled and hypothetical environment, we were only able to measure participants' hypothetical crafting behaviours, which reduced their ecological validity. Field research is still needed to support these experimental findings. However, due to the limitations of survey design as we discussed earlier, researchers may consider future field experiments (e.g., intervention studies that encourage individuals to adopt challenge appraisals to job demands) to replicate our results. Researchers could measure and compare participants' appraisals of demands (primary and secondary), and their job crafting behaviour, both before and after the intervention.

Thus, researchers could test whether the intervention affects individuals' job crafting via changes in their appraisals.

Second, we did not find that either job autonomy or self-efficacy had a moderating effect on the relationship between primary appraisal and control appraisal. In future, researchers could examine other potential moderators such as other job resources or personal resources. As employees do not work in a vacuum, other people's attitudes and support are also important to influence their control over a demanding situation. For example, supervisor and co-worker support may be potential moderators. When a job demand is appraised as a challenge, high level support from a supervisor and colleagues may increase an employee's sense of control.

Finally, due to the experimental research design, we cannot test the reversed causal effect between individuals' appraisals and job crafting. It is possible that individuals' demands crafting behaviours may affect how they appraise the demanding situation. Mackey and Perrewé (2014) indicated that after responding to a stressor, individuals receive feedback regarding the results of their response, which will be reflected in individuals' subsequent appraisals of job demands. For example, when an employee successfully optimizes the job demands, he/she is likely to have more positive appraisals of similar job demands. Future studies could investigate the reversed causality of individuals' appraisals and demands crafting.

Conclusion

Job crafting has been identified as an important way for employees to manage job demands. This paper draws on job crafting and stress theories to provide insights into when and why employees engage in optimizing demands versus reducing demands. Using a two randomized experiment strategy, we showed that individuals' challenge appraisal leads to higher optimizing demands via increased control appraisal, while hindrance appraisal directly leads to higher

reducing demands. Recognizing the significant role of individuals' appraisal in job crafting, we call for more attention on individuals' appraisals in future research and organizational practices.

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Appendix 1: Background scenario information in Study A and Study B

Assume that you are a full-time employee in GB company. Please read the material carefully to become familiar with your company and your job responsibilities. We will ask you some questions about your job after your reading.

GB company is a leading software development company. GB company aims for delivering strong and robust software solutions to clients to help their business grow.

You are a full-time software developer working in the development department of GB. Your responsibilities include:

1) Designing and developing software systems;

2) Testing and modifying existing software to correct errors, to adapt it to new hardware, and to upgrade interfaces and improve performance;

3) Preparing reports or correspondence concerning project specifications, activities, or status;

4) Coordinating installation of software systems.

In the past few months, you have been working on two development projects. One is at the testing phase and the client has reported some bugs to be modified and improved. The other is at the development phase and the client has requested several new functions in the software. As your company employ “agile development” (which means involving clients at every phase) you have to adjust the development according to clients’ needs. Both the modifying and adjusting of software development requires considerable time and effort.

Recently, the enquires and clients of GB have increased due to a series of marketing strategies. To keep all the projects running well, your development team was recently assigned another two new development projects.

Normally, you and your development team can comfortably deal with two projects simultaneously, usually working from 9am to 6pm. However, with four ongoing projects, your workload has increased at least one third, or even more. To handle the increased workload and to meet the deadline of each project, you need to work faster and harder than before. It is difficult for you to find break time during the workday. You find the whole development team is under great time pressure. Sometimes, you and your colleagues miss your lunch to catch up on the backlog.

Overall, you are working at a very fast pace. As all the projects cannot be completed in a short time period, you expect that this situation with high workload will last for a while.

Appendix 2: Primary appraisal manipulation in Study A

Challenge appraisal manipulation

Workload is the objective amount of work an individual has to do. There is a distinction between the actual amount of work (workload) and the individual's perception of the workload (perceived workload). Workload can also be classified as quantitative (the amount of work to be done) or qualitative (the difficulty of the work). In your case, the quantitative workload (actual amount of work to be done) has increased as a result of GB's workshops creating a large number of calls.

Workload is a major component of our work, with important consequences. Findings from a great number of scientific studies have shown that low levels of workload can cause job boredom, and reduce your work motivation and engagement. Low levels of workload can cause you to feel under-stimulated, which means you do not give full attention to your tasks and responsibilities. Low levels of workload can cause mistakes and impair work quality. On the other hand, high levels of workload help you stay focused, energetic, and alert. A high workload can boost your concentration and productivity. Employees with a high level of workload in their job are more likely to set challenging goals and utilize their skills to achieve their goals.

Hindrance appraisal manipulation

Workload is the objective amount of work an individual has to do. There is a distinction between the actual amount of work (workload) and the individual's perception of the workload (perceived workload). Workload can also be classified as quantitative (the amount of work to be done) or qualitative (the difficulty of the work). In your case, the quantitative workload (actual amount of work to be done) has increased as a result of GB's workshops creating a large number of calls.

Workload is a major component of our work, with important consequences. Findings from a great number of scientific studies have shown that high levels of workload can cause job stress, and can reduce your work motivation and engagement. High levels of workload can cause you to feel overwhelmed, which means you do not give full attention to your tasks and responsibilities. High levels of workload can cause mistakes and impair work quality. On the other hand, low levels of workload help you stay focused, energetic, and alert. A low workload can boost your concentration and productivity. Employees with a low level of workload in their job are more likely to set challenging goals and utilize their skills to achieve their goals.

Manipulation check results

In Study A, significant differences were found between the two appraisal conditions for challenge appraisal, $t(180) = -16.73$, $p < .001$, and for hindrance appraisal, $t(180) = 14.24$, $p < .001$, as would be expected. Participants in the challenge condition reported a greater challenge appraisal (4.31 ± 0.66, $N = 90$) than those in the hindrance condition (2.51 ± 0.79, $N = 92$). Participants in the hindrance condition reported a greater hindrance appraisal (3.96 ± 0.72, $N = 92$) than those in the challenge condition (2.18 ± 0.95, $N = 90$). These results indicated that the primary appraisal manipulation was successful.

Appendix 3: Job autonomy manipulation in Study A

High job autonomy

In your development department, you have some autonomy over aspects of your work. For example:

-You can have lunch any time that is convenient to you.

-You can use whichever work methods/schedules work best for you as long as they do not violate the company's regulations. For example, you can shift among different projects and decide when and which project you would like to work on.

-You have high decision latitude in your job. For example, you can try to figure out problems with your own solutions, although your project manager also gives you some suggestions.

Low job autonomy

In your development department, the work is standardized and there are strict requirements you must follow. For example:

-You must have lunch between 12-1pm

-You must use the work methods/schedules as specified by detailed job descriptions. For example, there is strict time requirement for working on different projects. For example, 9am-12pm is time to work on project A. You cannot shift among different projects without permission.

-You have very little decision latitude in your job. For example, you must follow the instructions your project manager gives to solve the problems.

Manipulation check results

In Study A, significant differences were found between the two job autonomy conditions, $t(180) = -30.79$, $p < .001$. Participants in the high autonomy condition (4.55 ± 0.62, $N = 101$) reported higher perceived job autonomy than those in the low autonomy condition (1.38 ± 0.76, $N = 81$).

Therefore, we concluded that the job autonomy manipulation was successful.

Appendix 4: Control appraisal manipulation in Study B

High control appraisal

With the high workload situation going on, you have evaluated your resources and capacities to cope with this situation. According to your evaluation, you feel that you have influence over this situation and can make changes in your job. Overall, you believe that coping with this situation is within your capacities.

Low control appraisal

With the high workload situation going on, you have evaluated your resources and capacities to cope with this situation. According to your evaluation, you feel that you do not have influence over this situation and cannot make changes in your job. Overall, you are afraid that coping with this situation is beyond your capacities.

Manipulation check results

In Study B, significant differences were found between the two control appraisal conditions, $t(143) = 12.34$, $p < .001$. Participants in the high control appraisal condition (4.16±0.80, N = 70) reported higher control appraisal than those in the low control appraisal condition (2.27±1.03, N = 75). Therefore, we concluded that the control appraisal manipulation was successful.

Table 1

Results for Confirmative Factor Analysis in Study A and Study B

		χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR	χ^2 difference test
Study A	Three factor model (1)	91.44	51	1.79	.07	.95	.93	.07	
	Two-factor model* (2)	267.43	53	5.04	.15	.71	.63	.13	*1 vs 2*, $p < .001$
	One-factor model (3)	442.19	54	8.19	.20	.47	.35	.17	*1 vs 3*, $p < .001$
Study B	Two-factor model (1)	19.46	19	1.02	.01	.99	.99	.04	
	One-factor model (2)	216.44	20	10.82	.26	.31	.03	.20	*1 vs 2*, $p < .001$

Note: * Optimizing demands and reducing demands were integrated as one factor.

Table 2

Comparison of Theorized Mediation Model and Alternative Models

	χ^2	df	AIC	BIC	ABIC	RMSEA	CFI	TLI	SRMR
Models based data in Study A									
Theorized model	0	0	1246.20	1284.31	1246.31	–	–	–	–
Alternative Model 1	1.56	1	1245.76	1280.70	1245.86	.06	.99	.94	.02
Alternative Model 2	3.67	1	1247.87	1282.80	1247.97	.12	.95	.71	.04
Alternative Model 3	5.10	2	1247.29	1279.05	1247.38	.09	.94	.83	.05
Models Based on Data in Study A and Study B									
Theorized model	0	0	1255.31	1282.40	1253.92	–	–	–	–
Alternative Model 1	.12	1	1253.42	1277.51	1252.19	0	1	1	.01
Alternative Model 2	6.09	1	1259.40	1283.48	1258.17	.18	.83	.01	.06
Alternative Model 3	6.23	2	1257.54	1278.61	1256.46	.12	.86	.59	.06

Note:

Alternative Model 1: No direct effect from primary appraisal to optimizing demands.

Alternative Model 2: No direct effect from primary appraisal to reducing demands.

Alternative Model 3: No direct effect from primary appraisal to optimizing demands and reducing demands.

Table 3

Mediation Model Results

	Control appraisal	Optimizing demands	Reducing demands
Theorized model in Study A			
Primary appraisal	.36*** (.07)	-.09 (.07)	-.15* (.08)
Control appraisal		.40*** (.08)	-.11 (.09)
Final model (alternative Model 1) in Study A			
Primary appraisal	.36*** (.07)	–	-.15* (.08)
Control appraisal		.37*** (.07)	-.11 (.09)
Model Based on Data in Study A and Study B			
Primary appraisal	.37*** (.07)	–	-.22* (.08)
Control appraisal		.23** (.08)	.04 (.09)

Note: Primary appraisal condition was dummy coded, challenge appraisal as 1, hindrance appraisal as 0. Path coefficients are standardized estimates from MPlus.

* $p<.05$, ** $p<.01$, *** $p<.001$

Table 4

Moderating Effects of Job Autonomy in Study A

	Control appraisal	Optimizing demands	Reducing demands
Primary appraisal	.41*** (.12)	–	-.15* (.08)
Job autonomy	.42*** (.08)		
Primary appraisal × job autonomy	-.07 (.12)		
Control appraisal		.40*** (.07)	-.11 (.09)

Note: Primary appraisal condition was dummy coded, challenge appraisal as1, hindrance appraisal as 0; job autonomy condition was dummy coded, high job autonomy condition as 1, low job autonomy condition as 0. Path coefficients are standardized estimates from MPlus.

The path from primary appraisal to optimizing demands was omitted based on the final mediation model.

* $p<.05$, ** $p<.01$, *** $p<.001$

Table 5

Moderated Mediation Effects in Study A

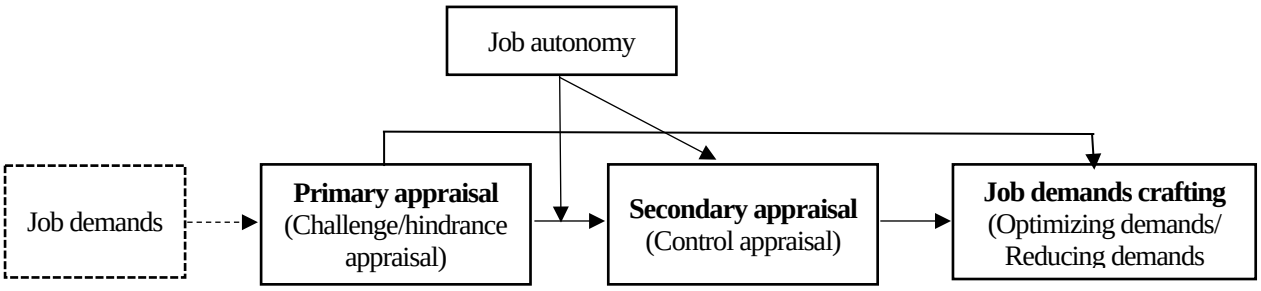
Mediating paths	Job autonomy	Indirect effect	*SE*	95% CI
Primary appraisal → Control appraisal → Optimizing demands	Low	.19	.07	[.07, .33]
	High	.15	.04	[.07, .24]
Primary appraisal → Control appraisal → Reducing demands	Low	-.08	.07	[-.22, .07]
	High	-.06	.05	[-.17, .05]

Table 6

Summary of Hypotheses Tested in Study A and Study B

Hypotheses	Study A	Study B
H1a: Challenge appraisal → optimizing demands	Not supported	—
H1b: Hindrance appraisal → reducing demands	Supported	—
H2: Challenge/hindrance appraisal → control appraisal	Supported	—
H3a: Control appraisal → optimizing demands	Supported	Supported
H3b: Control appraisal → reducing demands	Not supported	Not supported
H4a: Challenge appraisal → control appraisal → optimizing demands	Supported	
H4b: Hindrance appraisal → control appraisal → reducing demands	Not supported	
H5: Job autonomy → control appraisal	Supported	—
H6: Primary appraisal × job autonomy → control appraisal	Not supported	—

Figure 1: Hypothesized theoretical model



Note: The dotted box (job demands, that is workload in the two studies) was a study context and not included in the analysis.

Figure 2: Experiment procedure of Study A

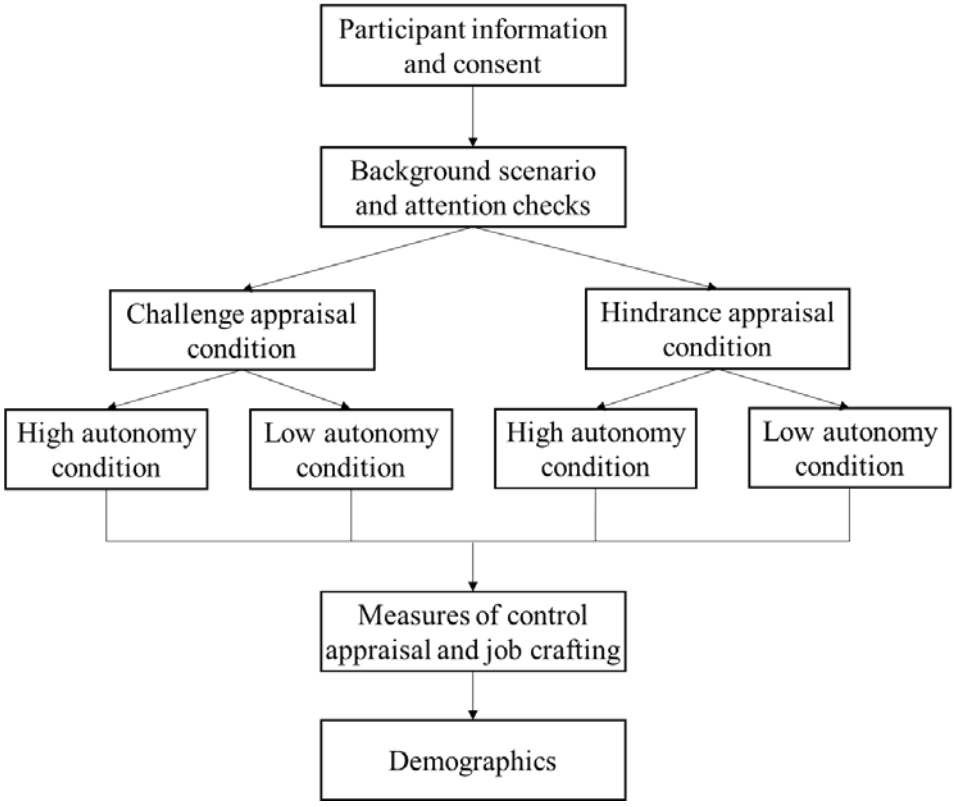
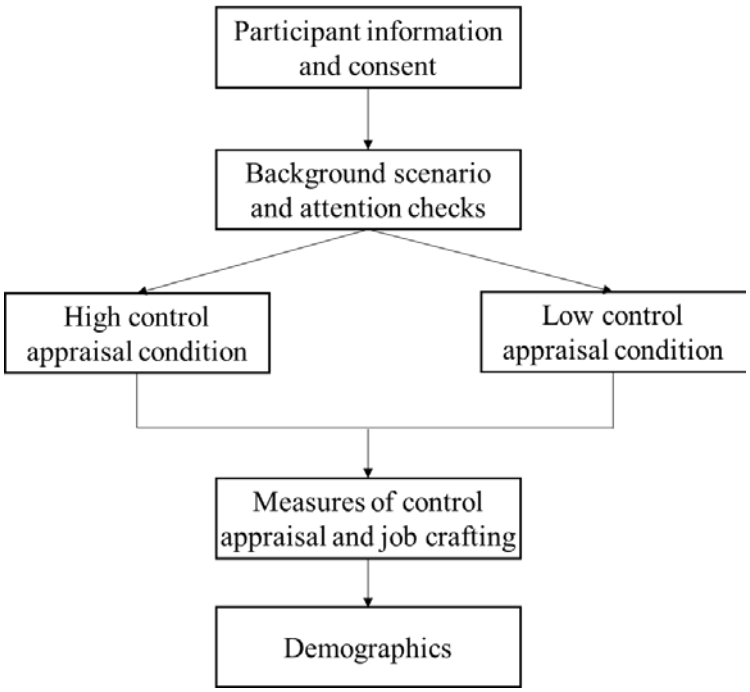


Figure 3: Experiment procedure of Study B



Supplement S.1: Sample size calculation

We used G*Power (Faul et al., 2007) to calculate the necessary sample sizes for each of hypotheses separately. We used $\alpha = 0.05$ and a high power of $\beta = 0.95$ which is higher than the convention standard ($\beta = 0.8$, Cohen, 1988).

To calculate the sample size for the main effects (H1, H2, and H3) within the theoretical model (Figure 1), we relied on the Pearson correlation r, which is recommended when effect sizes are reported within primary studies (Aguinis et al., 2011). We reviewed effect sizes reported in the literature on cognitive appraisals. There have not been studies on the relationship of challenge/hindrance appraisal with job crafting. However, studies have been done on the relationship between challenge/hindrance appraisal and coping. As optimising demands has been regarded as approach-oriented behaviour while reducing demands as avoidance-oriented behaviour, we used reported correlations of challenge/hindrance appraisal with problem-focused coping (similar to optimising demands) and emotional-focused coping (similar to reducing demands).

For H1, reported effect sizes have been r = 0.34 to 0.42 for the association of challenge appraisal with problem-focused coping and proactive behaviour (Cash & Gardner, 2011; Ohly & Fritz, 2010; Searle & Auton, 2015), and r = .41 to .45 for the association between hindrance appraisal and emotional-focused coping (Cash & Gardner, 2011; Searle & Auton, 2015). For H2, reported effect sizes have been r = .35 for the association between challenge appraisal and control appraisal, and r = -.46 for the association between hindrance appraisal and control appraisal (Kruse, 2013). For H3, reported effect sizes have been r = .41 for the association between perceived control and problem-focused coping, and r = -.30 for the association between perceived control and emotional-focused coping (Zakowski et al., 2001). We relied on the smaller value of reported effect sizes to obtain the most conservative estimate of sample sizes. Overall, reported effect sizes are medium according to the effect size standard for correlation (r = .10, small, r = .30, medium, r = .50, large, Cohen, 1988).

To calculate the sample size for the main effect of job autonomy (H5) and the interacting effect of job autonomy with primary appraisal (H6), we used Cohen's f^2 (Cohen, 1988). As we could not obtain the effect size of Cohen's f^2 from existing studies, to ensure we can detect meaningful effect, we assumed a medium effect size, which is Cohen's $f^2 = .0625$ for ANOVA (Cohen, 1988).

The largest sample size estimation for Study A is N = 171 and for Study B is N = 138. Considering some possible invalid responses that cannot meet our criteria, we planned to over-recruit for both studies (planned sample size for Study A is N = 200 and for Study B is N = 150).

Protocol of power analyses using G*Power for H1

Exact - Correlation: Bivariate normal model
Options: exact distribution
Analysis: A priori: Compute required sample size
Input: Tail(s) = Two
Correlation ρ H1 = 0.34

	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Correlation ρ H0	=	0
Output:	Lower critical r	=	-0.1908776
	Upper critical r	=	0.1908776
	Total sample size	=	106
	Actual power	=	0.9505177

Protocol of power analyses using G*Power for H2

Exact - Correlation: Bivariate normal model
Options: exact distribution
Analysis: A priori: Compute required sample size

Input:	Tail(s)	=	Two
	Correlation ρ H1	=	0.35
	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Correlation ρ H0	=	0
Output:	Lower critical r	=	-0.1965512
	Upper critical r	=	0.1965512
	Total sample size	=	100
	Actual power	=	0.9511833

Protocol of power analyses using G*Power for H3

Exact - Correlation: Bivariate normal model
Options: exact distribution
Analysis: A priori: Compute required sample size

Input:	Tail(s)	=	Two
	Correlation ρ H1	=	0.30
	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Correlation ρ H0	=	0
Output:	Lower critical r	=	-0.1671877
	Upper critical r	=	0.1671877
	Total sample size	=	138
	Actual power	=	0.9504014

Protocol of power analyses using G*Power for H5 and H6

F tests - MANOVA: Special effects and interactions
Options: Pillai V, O'Brien-Shieh Algorithm
Analysis: A priori: Compute required sample size

Input:	Effect size $f^2(V)$	=	0.0625

	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Number of groups	=	4
	Number of predictors	=	2
	Response variables	=	3
Output:	Noncentrality parameter λ	=	21.3750000
	Critical F	=	2.1259179
	Numerator df	=	6.0000000
	Denominator df	=	332
	Total sample size	=	171
	Actual power	=	0.9512109

Pillai V = 0.1176471

Supplement S.2: Means, standard deviations, and correlations of variables in Study A and B

Table 1

Means, Standard Deviations, and Correlations Among Variables in Study A (N=182)

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1.	Gender	0.43	0.50	—											
2.	Age	40.29	10.65	-.18*	—										
3.	Work experience	17.43	10.54	-.10	.76***	—									
4.	Weekly work hours	41.58	6.37	.19**	-.06	-.01	—								
5.	High workload experience	0.97	0.18	.04	.02	.13	.09	—							
6.	Self-efficacy	4.15	0.74	-.01	.16*	.09	.16*	.22*	—						
7.	Perceived workload	4.77	0.37	-.18*	.12	.17*	-.04	.01	.12	—					
8.	Appraisal condition	0.49	0.50	.01	.12	.03	.01	-.13	-.01	-.02	—				
9.	Job autonomy condition	0.55	0.50	-.05	-.15*	-.07	.16*	-.04	.02	-.17*	.00	—			
10.	Control appraisal	3.67	0.95	-.05	.01	-.05	.22*	.09	.33***	-.02	.37***	.39***	—		
11.	Optimising demands	4.34	0.62	-.07	.04	.15*	-.03	.14	.20**	.15*	.06	.19*	.38***	—	
12.	Reducing demands	3.07	0.91	-.04	-.01	.01	-.03	.01	-.03	.10	-.20**	-.01	-.17*	-.03	—

Note: Gender (male) as 1; Appraisal condition was dummy coded, challenge appraisal as1, hindrance appraisal as 0; job autonomy condition was dummy coded, high job autonomy condition as 1, low job autonomy condition as 0.

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

Table 2

Means, Standard Deviations, and Correlations Among Variables in Study B (N=145)

		M	SD	1	2	3	4	5	6	7	8	9	10
1.	Gender	0.58	0.50	—									
2.	Age	34.13	9.10	-.01	—								
3.	Work experience	12.86	9.19	.02	.86***	—							
4.	Weekly work hours	41.22	5.71	.22**	.12	.17*	—						
5.	High workload experience	1.06	0.24	-.13	.10	.06	-.12	—					
6.	Self-efficacy	4.20	0.60	.06	.12	.06	.06	-.20*	—				
7.	Perceived workload	4.66	0.57	-.02	.03	.03	.17*	-.19*	.26**	—			
8.	Control appraisal condition	0.52	0.50	.04	.01	.07	-.07	.15	.12	-.06	—		
9.	Optimising demands	4.31	0.56	-.07	.13	.09	-.07	-.15	.39***	.33***	.31***	—	
10.	Reducing demands	2.99	0.94	.06	-.02	-.11	.01	-.01	.03	.01	-.05	-.01	—

Note: Gender (male) as 1; Control appraisal condition was dummy coded, high control appraisal condition as1, low control appraisal condition as 0.

* $p<.05$, ** $p<.01$, *** $p<.001$

Table 3

Partial Correlations Among Focal Variables in Study A (N=182)

		1	2	3	4	5
1.	Appraisal condition	—				
2.	Job autonomy condition	.02	—			
3.	Control appraisal	.41***	.39***	—		
4.	Optimising demands	.10	.21**	.39***	—	
5.	Reducing demands	-.20**	.00	-.16*	-.04	—

Note: Controlling for gender, age, work experience, weekly work hours, dealing with high workload experience, perceived workload, self-efficacy.

Appraisal condition was dummy coded, challenge appraisal condition as1, hindrance appraisal condition as 0; job autonomy condition was dummy coded, high job autonomy condition as 1, low job autonomy condition as 0.

* $p<.05$, ** $p<.01$, *** $p<.001$

Table 4

Partial Correlations Among Focal Variables in Study B (N=145)

		1	2	3
1.	Control appraisal condition	—		
2.	Optimising demands	.34***	—	
3.	Reducing demands	-.04	-.02	—

Note: Controlling for gender, age, work experience, weekly work hours, dealing with high workload experience, perceived workload, self-efficacy.

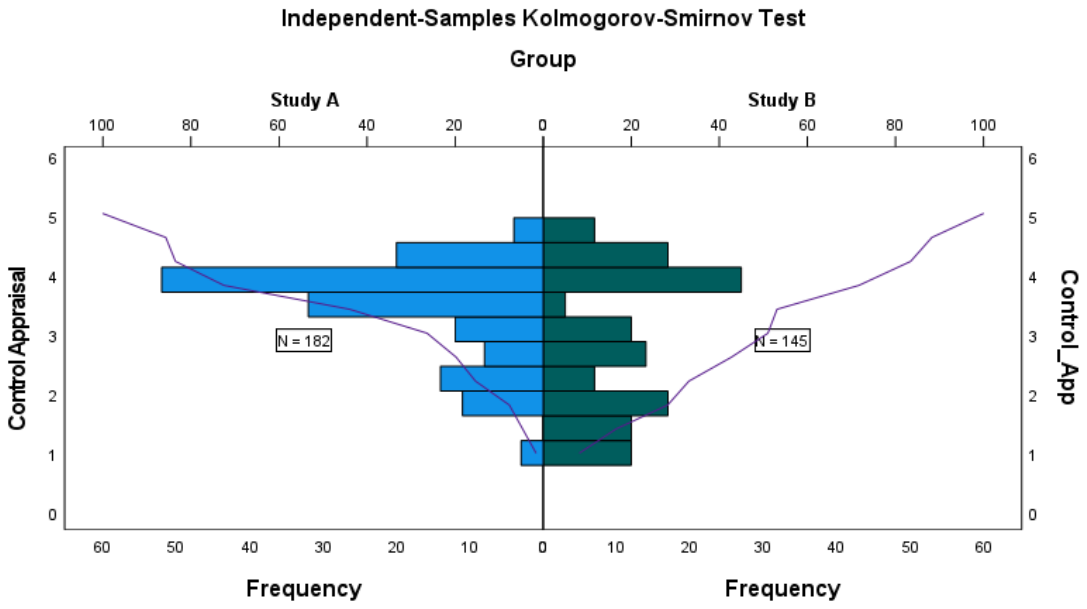
Control appraisal condition was dummy coded, high control appraisal condition as 1, low control appraisal condition as 0.

*** $p<.001$

Supplement S.3: Corrected correlations of r_{MY}

There is a distribution issue of the measured values of mediator (M_{obs}) and the manipulated values of mediator (M_{man}) in testing of mediation models using two randomized experiment design. M_{obs} is an endogenous random variable in Experiment 1 and its variance depends on the manipulation of the independent variable. M_{man} is an exogenous variable in Experiment 2 and its variance depends on the manipulation levels used in Experiment 2. Testing mediation models using two randomized experimental design requires that M_{obs} in Experiment 1 be equivalent to M_{man} in Experiment 2 (Stone-Romero & Rosopa, 2011).

Therefore, following the instruction of Stone-Romero and Rosopa (2011), we compared the distribution of M_{obs} (the observed values of control appraisal) in Study A and M_{obs} in Study B (the observed values of control appraisal). The two independent-samples kolmogorov-smirnov test result showed an unequal distribution, D (327) = 2.28, $p < .001$. The variance of control appraisal in Study B ($\sigma^2 = 1.75$) is larger than that in Study A ($\sigma^2 = .89$).



As the variance of M_{obs} and M_{man} are not equivalent to each other, we corrected the corrections between M_{man} and Y (the correlations of control appraisal with optimizing demands and reducing demands) for attenuation. We used below formula to compute the corrected correlations (Ghiselli et al., 1981, p.299). The variance of M_{obs} in Study A is used as the unrestricted estimate and the variance of M_{man} in Study B is used as the restricted estimate.

$$r_{xy} = \frac{r'_{xy}\left({}^{\sigma_x}/_{\sigma'_x}\right)}{\sqrt{1 - r'^2_{xy} + r'^2_{xy}\left({}^{\sigma_x^2}/_{\sigma'^2_x}\right)}}$$

Table 5

Meanings of Indicators in the Formula

Indicators	Meanings
r_{xy}	Corrected correlation of r_{MY}
r'_{xy}	Observed correlation of r_{MY}
σ_x	Unrestricted standard deviation of mediator in Study A
σ'_x	Restricted standard deviation of mediator in Study B

The corrected correlation of control appraisal with optimising demands is .23.

$$r_{xy} = \frac{(0.31)(^{0.95}/_{1.32})}{\sqrt{1-(0.31)^2+(0.31)^2[^{(0.95)^2}/_{(1.32)^2}]}} = 0.23$$

The corrected correlation of control appraisal with reducing demands is -.04.

$$r_{xy} = \frac{(-0.05)(^{0.95}/_{1.32})}{\sqrt{1-(-0.05)^2+(-0.05)^2[^{(0.95)^2}/_{(1.32)^2}]}} = -0.04$$

Supplement S.4: Correlations used for path analysis with data in Study A and Study B

Table 6

	1	2	3	4
1. Challenge appraisal	—			
2. Control appraisal	.37	—		
3. Optimising demands	.06	.23	—	
4. Reducing demands	-.20	-.04	-.02	—

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