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Ben J. Searle and Jaime C. Auton

Department of Psychology, Macquarie University, NSW, 2109, Australia

Email: ben.searle@mq.edu.au

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Corresponding Author:

Dr Ben Searle
Department of Psychology
Faculty of Human Sciences
MACQUARIE UNIVERSITY NSW 2109

Phone: +61 2 9850 8066
Fax: +61 2 9850 8061
Email: ben.searle@mq.edu.au

The Merits of Measuring Challenge and Hindrance Appraisal

Abstract

Background and Objectives: The challenge—hindrance framework has shown that challenge stressors (work characteristics associated with potential personal gain) tend to have positive outcomes, while hindrance stressors (those which obstruct goals) have negative outcomes. However, typical research methods assume that stressors allocated to these categories are appraised consistently by different people and across different situations. We validate new measures of challenge and hindrance appraisal and demonstrate their utility in stress research.
Design and Methods: We used a cross-sectional survey of American employees (Study 1, n = 333), a diary survey of Australian employees (Study 2, n = 241), and a survey of Australian college students whose performance was evaluated independently (Study 3, n = 350).
Results: Even after accounting for the effects of stressors, challenge and hindrance appraisals consistently explained unique variance in affective states, with indications that stressors have indirect effects via appraisals. Such effects were seen within- as well as between-participants (Study 2). Appraisals also had expected associations with specific coping behaviors (Study 1), while challenge appraisal was associated with task performance (Study 3).
Conclusions: The scales of challenge and hindrance appraisal were psychometrically sound across multiple contexts. Results highlight the merit of considering appraisal in stress research.

The Merits of Measuring Challenge and Hindrance Appraisal

Stress can be harmful, not only for individual well-being (e.g., Cooper & Cartwright, 1994) but also by affecting individual behavior and performance (e.g., Motowidlo, Packard, & Manning, 1986; Rodell & Judge, 2009), which can impact on other people. Much research has focused on common antecedents of stress (known as stressors), in part due to assumptions that minimizing these stressors should improve well-being (e.g., Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964). However, different implications arise from the challenge—hindrance stressor framework (Cavanaugh, Boswell, Roehling, & Boudreau, 2000), which distinguishes the traditional negative stressors from stressors that have positive impacts.

Cavanaugh et al. (2000) categorized stressors according to their potential to support an employee's goals (*challenge stressors*, such as workload and time pressure) or to obstruct goal attainment (*hindrance stressors*, such as role ambiguity and role conflict). While both types could cause stress, the stress resulting from challenge stressors was associated positively with job satisfaction and negatively with intention to leave, but the opposite was true of hindrance-related stress. Further research in this framework has similarly used *a priori* categorization of the two stressor types, with results showing differential effects on strain, attitudes, motivation and even performance (e.g., LePine, LePine, & Jackson, 2004; Podsakoff, LePine, & LePine, 2007).

Yet categorizing stressors involves assumptions about how they are interpreted. In their transactional theory of the stress process, Lazarus and Folkman (1984) describe two types of appraisal. Primary appraisal involves evaluating a situation's potential for gain or loss, while secondary appraisal involves evaluating one's capacity to cope with the situation. Primary appraisals include *threat appraisal* ("harms or losses that have not yet taken place but are anticipated", p. 32) as well as *challenge appraisal* which "focus[es] on the potential for gain or growth inherent in an encounter" (p. 33). The implication is that one stressor can be interpreted in

different ways: “many everyday stressors are neither clearly positive nor negative and so are most likely to be open to personal appraisal” (Hobfoll, 1989, p. 519). Consistent with transactional theory, Webster, Beehr, and Love (2011) found several stressors were appraised as both challenging and hindering. In three studies, we aim to address limitations in past research by developing valid measures of challenge and hindrance appraisal, and to show that these appraisals, independently of stressor categories, predict a variety of outcomes.

Measuring Stress Appraisals

Most research on the challenge-hindrance framework uses *a priori* categorizations of stressors as challenges and hindrances. Participants report either the amount of stress caused by stressors in each category (e.g., Cavanaugh et al., 2000; LePine et al., 2004), or, more commonly, the experienced level of the work stressors (e.g. LePine, Podsakoff, & LePine, 2005; Rodell & Judge, 2009). Yet if an event can be appraised differently by different people, or by the same person on different occasions, neither approach can be assumed to reflect individual appraisals. Part of the problem may be that appraisals have proved difficult to measure.

Cavanaugh et al. (2000) avoided measuring individual appraisals of potential gain or loss, citing two studies to indicate that measuring appraisal inevitably creates measurement bias. One study asked about stressful events from the past year (Scheck, Kinicki, & Davy, 1997), while the other asked about events from the past three years or longer (Bhagat, McQuaid, Lindholm, & Segovis, 1985). In both cases, respondents indicated their appraisal by rating the *impact* of those events. Beyond the measurement biases in these approaches (e.g., memory bias, where important details may be forgotten; and percept-percept bias, where having semantically related items in two different measures artificially inflates their relationship), they lack construct validity because such ratings do not indicate how each event was appraised *at the time when it occurred*. Events that are initially appraised positively (such as a promotion) can subsequently result in negative

outcomes, or vice versa, so retrospective measures of appraisal should be avoided.

Tomaka, Blascovich, Kelsey, and Leitten (1993) correctly described challenge and threat as primary appraisals, and assessments of coping resources and abilities as secondary appraisals. Despite this, Tomaka and colleagues operationalized appraisal as the ratio of perceived threat to perceived coping capability. Threat appraisal is inferred from a high threat:coping ratio, while challenge appraisal is inferred from a low threat:coping ratio. This approach has been influential, and continues to be used in studies of appraisal (e.g., Howle & Eklund, 2013). However, it is inconsistent with several elements of Lazarus and Folkman's (1984) theory: their definition of challenge appraisal as perceived potential for gain/growth, their assertion of the independence of challenge and threat appraisals, and their distinction between primary and secondary appraisals.

Some scales described as appraisal measures instead assess affective states. For example, a challenge appraisal scale by Ferguson, Matthews, and Cox (1999) involves rating stressful events using such items as "exhilarating" and "exciting". Yet a similar measure used by Folkman and Lazarus (1985) was described as measuring "challenge emotions", clarifying that such measures do not measure appraisal *per se*, but rather the emotional response to appraisal.

Although hindrance appraisals were not mentioned by Lazarus and Folkman (1984), Lazarus later wrote , "Frustration is often treated as an emotion, but like challenge and threat, I regard it as an appraisal" (1991, p. 827). We propose that frustration is equivalent to appraising an event or situation as a hindrance, since frustration has long been linked to being hindered from pursuing self-relevant goals (e.g. Dollard, Doob, Miller, Mowrer, & Sears, 1939). This can even be seen in conventional definitions of frustration (e.g., "the prevention of the progress, success, or fulfilment of something", Frustration 2, 2013).

Webster et al. (2011) measured both challenge and hindrance appraisal in relation to workload and responsibility (challenge stressors) as well as role conflict and role ambiguity

(hindrance stressors). Definitions of challenge and hindrance were used to help participants indicate the perceived impact of each stressor. Workload, role conflict, and role ambiguity were all associated positively with both challenge and hindrance appraisals, and furthermore that hindrance appraisals appeared to mediate effects of stressors on strain, dissatisfaction and turnover intention. These findings show that appraisals can be measured and that they play an important role in relations between stressors and well-being.

Yet Webster et al.'s (2011) report no construct validation, which was unfortunate as their approach has limitations. The supplied definitions included "something you think you can overcome" (for challenge; p. 508) and "something impossible to overcome" (for hindrance). Like Tomaka et al.'s (1993) approach, this confounds primary and secondary appraisal. We acknowledge that primary and secondary appraisals have the potential to influence one another, but confounding them is inconsistent with construct definitions and precludes the investigation of relations between appraisals. Single- item measures also preclude management of measurement error (Byrne, 2010). Thus we suggest that there is still a need for valid, multi-item measures of challenge and hindrance appraisal that are not confounded with secondary appraisal.

Aims and Hypotheses

In three studies (each approved by the researchers' institutional review board) we describe the development and validation of new scales of challenge and hindrance appraisals that overcome the limitations of earlier measures, and use these scales to better explain relations between stressors and stress responses. We intended that the scales be appropriate for appraising a variety of phenomena, such as specific recent events (e.g. Ferguson et al., 1999; Tomaka et al., 1993), specific work stressors (e.g., Webster et al., 2011), or one's situation as a whole over a specific time period (e.g., Ohly & Fritz, 2010). We also intended them to be valid and useful across a variety of different contexts.

Valid measures of any phenomenon should converge with conceptually similar phenomena. The most obvious starting point was existing measures of challenge and hindrance appraisal. While they were not themselves validated, the appraisal measures by Webster et al. (2011) should provide a reasonable indicator of convergent validity.

H1: Our challenge appraisal scale will be positively related to another challenge appraisal measure (1a), while our hindrance appraisal scale will be positively related to another hindrance appraisal measure (1b).

Lazarus and Folkman (1984) saw a close connection between appraisal and emotion, and they expected challenge appraisal to stimulate "eagerness, excitement and enthusiasm" (p. 33). These emotions are sometimes described as activated positive affect (Warr, Bindl, Parker, & Inceoglu, 2014), since they combine positive valence (feeling good) with activation (feeling energetic). The activation dimension of emotion is a useful one in stress research, since it can be related to the evolutionary function of the stress process, whereby stress stimulates the mobilization of physiological resources to aid survival (Selye, 1976). As other researchers have used activated positive affect as an indicator of challenge appraisal (e.g., Ferguson et al., 1999), they should serve as an indicator of convergent validity for the challenge appraisal scale.

In terms of hindrance appraisal, the activated negative affect state of anger may indicate convergent validity. The frustration-aggression hypothesis (Dollard et al., 1939) is one of many theories that link goal-obstruction with anger. A diary study by Rodell and Judge (2009) showed hindrance stressors to be associated with anger. Consistent with Lazarus' (1991) interpretation of frustration as a form of appraisal, anger may be enhanced by the perception that an event, stressor or situation (whether or not it would be categorized as a hindrance stressor) seems to be a hindrance.

H2: Our challenge appraisal scale will be positively related to activated positive affect

(2a), and our hindrance appraisal scale will be positively related to anger (2b).

The remaining hypotheses relate to the utility of measuring appraisal, particularly within the challenge—hindrance framework. Lazarus and Folkman (1984) argued that different individuals can vary in their appraisal of the same event, stressor or situation, and that appraisals can directly influence stress responses. Logically, then, appraisals should directly influence these stress responses even after accounting for the direct effects of stressors. We extend our second hypothesis to cover an effect that persists after controlling for the direct effects of stressors, thus:

H3: Even after controlling for the effects of challenge and hindrance stressors, challenge appraisal will be positively related to activated positive affect (3a), and hindrance appraisal will be positively related to negative activated affect (3b).

Appraisals are thought to influence coping, the cognitive and behavioral efforts applied in response to a stressful encounter (Lazarus & Folkman, 1984). Lazarus (1991) argued that appraisals affect the goals of subsequent coping efforts (e.g., seize an opportunity or minimize harm). Measurement problems aside, several studies have linked indicators of challenge appraisal with problem-focused coping tactics (e.g., McCrae, 1984; Moos, Brennan, & Fondacaro, 1990), those intended to modify the source of stress. This suggests that when a stressful situation appears to have potential benefits, this may activate more approach-oriented goals best achieved via problem-focused coping. What has not yet been established is whether, as we expect, such coping behaviors will be influenced by appraisal over and above the effects of challenge stressors.

A form of coping that seems a likely consequence of hindrance appraisal is venting, the process whereby negative emotions are purged through verbal expression, often to others (Pearlin & Schooler, 1978). In a study of salespeople's responses to losing a sale, venting was the form of coping most strongly associated with anger (Brown, Westbrook, & Challagalla, 2005). If

negative work events can result in more venting when workers feel more frustrated, then hindrance appraisal may affect the choice of venting as a coping tactic.

H4: Even after controlling for the effects of challenge and hindrance stressors, challenge appraisal will be positively related to problem-focused coping tactics (4a), and hindrance appraisal will be positively related to venting (4b).

Finally, we investigate appraisals as mediators. The transactional theory proposes that stressful encounters influence emotions and behavior via appraisal. Even in challenge—hindrance research, where appraisals are rarely measured, appraisal is commonly cited as the mechanism by which stressors have their impact (e.g., LePine et al., 2005). Webster et al. (2011) found that appraisals mediated effects of stressors on outcomes, yet most effects were mediated via hindrance appraisals alone, perhaps because all of the study outcomes were negative. The present study extended previous work by examining the extent to which positive as well as negative stress responses are mediated by challenge and hindrance appraisals. The responses we examine include affective states, coping and in Study 3 an independent measure of task performance.

H5: Challenge appraisal will mediate effects of stressors on activated positive affect, problem-focused coping and task performance (5a), and hindrance appraisal will mediate effects of stressors on negative activated affect, venting, and task performance (5b).

Study 1

Our first objective was to develop suitable items for measuring appraisals of challenge and hindrance, and to validate these in relation to related constructs. To evaluate the effectiveness of appraisal scales for different purposes, this study was conducted in two parts. One focused on a recent stressful or emotional event, allowing us to examine event-specific appraisals, affective states, and coping responses. This is consistent with early work on the transactional model (Lazarus & Folkman, 1984), which largely discussed the stress process in terms of discrete

events. The other focused on a specific stressor, daily time pressure at work, allowing us to examine stressor-specific appraisals, affective states, and coping responses. Consistent with Webster et al. (2011), one way to examine the limitations of the challenge—hindrance model is to look at specific stressors and how they are appraised. Time pressure was chosen as the focal stressor because it is consistently categorized as a challenge, yet it is known to have both positive and negative impacts (Widmer, Semmer, Kaelin, Jacobshagen, & Meier, 2012).

Method

Participants and procedure.

Americans in full-time work who were aged between 18 and 65 were recruited via a commercial panel provider (Qualtrics/SSI) who provided a small financial incentive (US$2.20) for survey completion. All participants who started the survey completed the whole survey. The survey began with a summary of study aims and requirements, and participants had to indicate whether or not they consented; this procedure was duplicated in Studies 2 and 3. The sample comprised 164 females and 169 males. Age groups represented were 18-25 years (4.5% of the sample), 26-35 (15.3%), 36-45 (25.2%), 46-55 (35.1%), and 56-65 (19.8%).

Materials.

Challenge and hindrance appraisal. Appraisal items were generated from published definitions of "challenge" and "hindrance" (especially Cavanaugh et al., 2000, and Lazarus & Folkman, 1984), taking care to minimize conceptual or semantic overlap with work characteristics or emotional or behavioral stress responses. Items were judgments of expected impact on personal growth and/or achievement, either enhancement (challenge) or obstruction (hindrance). A content analysis was conducted whereby three researchers familiar with transactional theory and the challenge—hindrance framework sought consensus on which items represented which constructs. Consensus was reached for the 16 items.

These were examined in a pilot study with 115 psychology students (77.4% female; aged 19 to 55, $M = 22.84$, $SD = 5.00$). Items were framed as relating to a class assignment ("Indicate the extent to which you agree that the following statements describe how the requirements and procedures of your assignment will affect you") and were phrased in future tense in order that, consistent with Lazarus and Folkman's conceptualization, they assessed anticipated future impact (e.g., "*will make the work challenging*"[1]). Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Principal axis exploratory factor analyses indicated the items reflected one challenge factor and one hindrance factor. All items loaded adequately on the appropriate factor (> .50, cross loadings < .20), but one challenge appraisal item and three hindrance items were identified as having lower inter-item correlations and were removed prior to Study 1.

For Study 1, two sets of 12 appraisal items were used. One involved interpretations of the likely impact of a recent stressful or emotional event ("Think about something that happened today, preferably in the last hour or two, which affected how you feel... Please now assess how the event is likely to affect you in the future"). The other was framed as interpretations of the likely impact of the day's time pressure ("Thinking about the amount of time pressure you are experiencing today, please now assess how this time pressure is likely to affect you"). Thus, the item "It will help me to learn a lot" refers to the impact of the event in the first framing, and the impact of time pressure in the second.

To assess convergent validity, we used Webster et al.'s (2011) single-item measures to assess separately participants' appraisals of the recent stressful event and the day's time pressure.

Situational affect. Participants indicated the extent to which the recent event and the day's

[1] Cognitive interviews conducted with 20 of the participants (to further evaluate item interpretation; Willis, 2005) indicated this item was frequently interpreted as "make the work too hard", which is inconsistent with Lazarus and Folkman's (1984) definition and more akin to a hindrance.

time pressure had each caused them to feel certain emotions. Consistent with Rodell and Judge (2009), response options ranged from 1 (*very slightly or not at all*) to 5 (*very much*). We used the same items as Rodell and Judge (2009) to measure anger (angry and hostile; α = .86 for recent event and .90 for time pressure). To assess activated positive affect we used two items (enthusiastic and excited; α = .90 for recent event and .91 for time pressure) from the High-Activation Pleasant Affect subscale of the MultiAffect Indicator (Warr et al., 2014).

Coping behavior. Subscales from the Brief COPE (Carver, 1997) assessed how people had responded to a recent event as well as to the day's time pressure. To measure problem-focused coping we used the active coping (e.g., "I've been taking action to try to make the situation better") and planful coping (e.g., "I've been trying to come up with a strategy about what to do") subscales. As factor analysis showed these subscales could not be distinguished empirically ($r > .95$) they were treated as a single scale of problem-focused coping (α = .90 for recent event and .92 for time pressure). We also used the venting subscale (e.g., "I've been expressing my negative feelings"; α = .80 for recent event and .88 for time pressure). Response options ranged from 1 (*I haven't been doing this at all*) to 4 (*I've been doing this a lot*).

Time pressure was measured with the three items (α = .89) used by Sonnentag and Bayer (2005) to assess daily time pressures. Participants indicated agreement (from 1, *strongly disagree*, to 5, *strongly agree*) to such items as "Today I have been required to work fast in my job".

Analysis.

MPlus (version 6.12) was used for analyses. Confirmatory factor analysis (CFA) was used to examine how appraisal scale items fit possible latent factor structures. This allowed us to refine the items and determine whether they reflected one or two factors. The consistency of factor loadings and structures was compared across the two appraisal foci. Once the appraisal

scales were finalized, construct convergence and divergence were assessed using simple correlations, CFA measurement models, and tools by Gaskin (2012) for calculating average variance extracted (AVE, the mean of squared factor loadings) and maximum shared variance (MSV, the largest covariance with another variable). Finally, structural equation models (SEMs) were used to assess the unique relations between each type of appraisal and stress responses (affect and coping). As Mardia indices (sample values > 55) revealed multivariate non-normality in the data, MLM estimation was used whereby maximum likelihood parameter estimates produce standard errors and mean-adjusted chi-square statistics that are robust to non-normality. Bootstrapping with 1000 samples was used to calculate confidence intervals (CIs) for indirect effects (consistent with Preacher & Hayes, 2008).

Chi-square ($\chi 2$) tests are useful for comparing relative fit of nested models (done in MPlus using Wald tests) but are less useful for determining absolute model fit. Hu and Bentler (1998) suggest model fit is best assessed using the following criteria: values close to or above .95 on the confirmatory fit index (CFI) and Tucker-Lewis index (TLI), and close to or below .06 on the standardized root-mean-square residual (SRMR) and root-mean-square error of approximation (RMSEA, for which values between .06 and .08 indicate fair fit and values > .10 indicate poor fit; Browne & Cudeck, 1993).

Results and Discussion

Scale structure and refinement. We began with seven challenge appraisal items and five hindrance appraisal items, using CFA to evaluate different factor structures and item subsets. Two-factor models fit consistently better than one-factor models for both appraisal foci ($\Delta\chi^2$ (1) > 187, $p < .001$), but as no model met all criteria for good fit, item refinement was necessary. As recommended by Byrne (2010), decision criteria included model fit, factor loadings, modification indices, and standardized residual covariances (SRCs), with consideration always given to item

meaning, wording and the implications of item removal for the remaining scale. The item "will make the work more challenging" was removed as its factor loading, while adequate (.65 to .67), was the lowest of all items in all models, it attracted high (> 2) SRCs, and modification indices and correlations suggested it was related positively to hindrance appraisal (consistent with pilot study findings). The items "will develop my skills" and "will contribute to my sense of achievement" were removed on the basis of factor loadings and SRCs. The item "will undermine my efforts" was removed partly on model fit grounds, but mostly out of concern that it implied stressors have agency and intent. For the remaining eight items, a two-factor model fit consistently well for both foci as shown in Table 1 (and better than one-factor models; $\Delta\chi^2$ (1) > 172, $p < .001$). As shown in Table 1, scales were reliable and factor loadings were sufficiently high that AVEs were above .50 (a validity criterion; Hair, Black, Babin, & Anderson, 2010).

To rule out the possibility that instead of measuring genuine stress appraisals we had measured constructs (such as traits) that were stable across both foci, we tested a measurement model that included four latent variables: a challenge and a hindrance appraisal factor for each focus area. This model fitted well (χ^2 (98) = 173.68, $p < .001$; CFI = .98, TLI = .98, RMSEA = .048, SRMR = .037), and the AVE for each scale exceeded the scale's MSV (an indicator of discriminant validity; Hair et al., 2010), with only 46% variance shared between challenge appraisal variables and 56% shared between hindrance appraisal variables. An alternative model, where items were combined across focus areas into one challenge factor and one hindrance factor, did not fit so well (χ^2 (103) = 1102.38, $p < .001$; CFI = .76, TLI = .72, RMSEA = .171, SRMR = .091). This suggests that the appraisal scales are sensitive to the same person appraising different things.

Validation. Consistent with H1a, our challenge appraisal scales were positively associated with the Webster et al. (2011) challenge item (r = .57 for recent event, r = .50 for time pressure; p

< .001). Consistent with H1b, our hindrance appraisal scale was positively associated with Webster et al.'s hindrance item (r = .57 for recent event, r = .63 for time pressure; p < .001). CFA measurement models differentiated challenge and hindrance appraisals from the affective states associated with stressful events and stressors. Nevertheless, as shown in Table 2, these affective states were related to stress appraisals as we predicted. Higher challenge appraisal was associated with more activated positive affect, consistent with H2a, while higher hindrance appraisal was associated with more anger, consistent with H2b. All of these findings suggest our scales are valid indicators of challenge and hindrance appraisal.

Utility. The recent stressful event SEM (Model 1A) examined challenge and hindrance appraisals as well as event-related affective states and coping behaviors. Covariation was permitted between appraisal variables and between error terms for affect and coping variables. The model fitted the data well (χ^2 (120) = 170.85, p = .002; CFI = .99, TLI = .98, RMSEA = .036, SRMR = .032). As shown in Table 3, higher levels of challenge appraisal were associated with more problem-focused coping, more activated positive affect and less anger. Higher levels of hindrance appraisal were associated with more venting and anger.

However, tests of utility required us to control for the effects of a stressor, which was possible in the time pressure SEM (Model 1B), which examined daily time pressure and challenge and hindrance appraisals as well as time pressure-related affect and coping. Effect paths were drawn from time pressure to the appraisal variables, modelling error covariance across appraisals. Covariance was also modelled between error terms for affect and coping variables. Model 1B fitted the data well (χ^2 (168) = 238.04, p < .001; CFI = .99, TLI = .98, RMSEA = .035, SRMR = .036) and explained significant variance in all outcome variables, as shown in Table 3. Time pressure was positively related to both appraisals, indicating that time pressure (a challenge stressor) was appraised as a hindrance at least as much it was appraised as a challenge. Time

pressure was also positively associated with all outcome variables. Yet even after controlling for the effects of time pressure, higher levels of challenge appraisal were independently associated with more activated positive affect (consistent with H3a), and more problem-focused coping (consistent with H4a). Similarly, higher levels of hindrance appraisal were independently associated with more anger (consistent with H3b), and with more venting (consistent with H4b). In Model 1B, more hindrance appraisal was also associated with less activated positive affect.

In Model 1B we were also able to examined indirect effects of time pressure via appraisal. Consistent with hypothesis 5, the results showed indirect effects of time pressure via appraisal on all outcome variables. As shown in Table 3 and consistent with H5a, time pressure had an indirect influence, via challenge appraisal, on activated positive affect (95% CI = .05 to .18, $p < .001$) and problem-focused coping (95% CI = .04 to .15, $p = .001$). Time pressure also had an indirect influence, via hindrance appraisal, on anger (95% CI = .05 to .18, $p < .001$) and venting (95% CI = .07 to .21, $p < .001$), consistent with H5b.

With our time pressure data it was also possible to test the utility of appraisal measures by forming a comparison model (1C) in which effects from appraisals to affect and coping variables were fixed at zero. Model 1C did not fit the data as well as model 1B ($\Delta\chi 2$ (8) = 261.95, p < .001). Also, as shown in Table 3, the failure to model effects of appraisal variables on the outcome variables meant that significantly less variance was explained in those variables.

Interpretation. In a sample of American employees, our scales were psychometrically sound and capable of distinguishing appraisals of challenge and hindrance in relation to different things. Consistent with hypothesis 1, our scales were associated with items by Webster et al. (2011), and similar to their finding about workload, we saw time pressure appraised as a hindrance as much as it was appraised as a challenge. Challenge appraisal was also associated with activated positive affect, while hindrance appraisal was associated with anger, consistent

with hypothesis 2. Our appraisal scales predicted unique variance in affect and coping variables after accounting for the effects of time pressure, consistent with hypotheses 3 and 4. There were even indications that the effects of time pressure were partially mediated via appraisal, with indirect effects consistent with hypothesis 5. These findings suggest that there is utility in including valid appraisal measures in investigations of the impact of stressors. However, we recognize the limitations of the cross-sectional study design, and so we attempted to address these limitations in the next two studies.

Study 2

Appraisal is dynamic, changing over time as one encounters new situations or reconsiders one's circumstances (Lazarus & Folkman, 1984). For a measure of appraisal to be valid, it should vary from one work day to the next (Ohly & Fritz, 2010). Experiential or 'diary' survey research designs, along with multi-level analysis methods, allow an examination of dynamic relations between variables within people, while still revealing between-person effects. As a major focus of this paper has been on appropriate measurement of appraisal, it was important to determine whether our appraisal scales displayed appropriate levels of within-person variation. Study 2 does this, while also providing more explicit tests of hypotheses 4 (incremental effects) and 6 (mediation effects) by using broad measures of challenge and hindrance stressors.

Method

Participants and procedure.

Australian adults working full-time were recruited through student networks to complete an online survey over three to four consecutive work days. Those who completed at least three surveys were eligible to register in a prize draw (for one of two $50 shopping vouchers). Survey links were emailed to participants at the same time each day (12:30pm). A total of 431 people commenced at least one survey, with 355 completing one survey or more, 293 completing two or

more surveys, 241 completing at least three and 101 completing all four surveys. Participants were only included in the study if they completed at least 95% of each survey for at least three days, in order to better evaluate within-person effects. In all but 28 of cases, participants were excluded due to attrition rather than missing data. The final sample comprised 150 females and 91 males. Ages ranged from 18 to 67 years (M = 33.25, SD = 14.14). Most participants were in permanent work roles (82.5%, compared to 17.5% in casual roles).

Materials.

Challenge and hindrance appraisals were framed as interpretations of the day's work situation and events. The appraisal items were framed in terms of daily events and situations ("Please indicate the extent to which you agree that the following statements describe today's stressful work events and situations"), such that the item "They will help me to learn a lot" refers to the impact of these events and situations. Factor loadings and reliability are shown in Table 1.

Challenge and hindrance stressors were measured using two scales by Rodell and Judge (2009), which frame items as that day's experience of challenging or hindering work stressors (e.g., "Today my job has required me to work very hard" [challenge], and "Today I have not fully understood what is expected of me" [hindrance]). Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Factor analyses of the original 16 items led to the exclusion of two challenge items (six remained; α = .84) and one hindrance item (seven remained; α = .86).

Daily affect. We measured anger (α = .86) and activated positive affect (α = .87) with the same items as in Study 1, although participants were asked to indicate the extent to which they had experienced each affective state that day.

Analysis.

Results were analyzed in MPlus using multi-level analysis, which separates variation in each participant's day-to-day responses from variation attributable to consistent differences

between participants across all days. Such methods allow examination of things that change within a person from one day to the next (e.g., daily stressors, appraisals, and stress responses) as well as examination of stable between-person factors (e.g., chronic stressors). Analysis of within-person relations is also helpful for managing common method variance attributable to stable characteristics (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). MPlus estimates models from available data using full information maximum likelihood; this was how missing data was handled for 11 participants (4.5% of the sample) who left 1-2 items blank.

Factor structures were expected to be consistent at both within- and between-person levels. Thus, a multi-level CFA was performed on each variable set (appraisal, stressors, and affect) to test the fit of items to the anticipated factor structures at both levels. Next, a full measurement model with all items was constructed to assess divergence of latent constructs. Due to the limited sample size, predictive models were tested using path analysis with composite variables formed from scale means. To facilitate interpretation, within-person variables were group-mean centered and between-person variables were grand-mean centered (Enders & Tofighi, 2007).

Results and Discussion

At both levels of analysis, CFA supported the two-factor model of appraisal items used in Study 1, as shown in Table 1. CFA also supported differentiating activated positive affect from anger (χ^2 (2) = 11.63, p = .003; CFI = .99, TLI = .96, RMSEA = .051, SRMR = .018 to .029). The stressor scales were more problematic. To reach adequate fit (χ^2 (124) = 350.00, p < .001; CFI = .91, TLI = .89, RMSEA = .059, SRMR = .077 to .128), we had to remove a hindrance item (the only reverse-coded item) and two challenge items (about feelings of work responsibility and responsibility for counseling colleagues) and permit covariance between the error terms for two challenge items (both about skill demand) and two hindrance items (both about role ambiguity).

This resulting measurement model had adequate fit (χ^2 (516) = 1218.00, $p < .001$; CFI = .92, TLI = .91, RMSEA = .041, SRMR = .053 to .116), and the AVE for each scale exceeded that scale's MSV, indicating that all variables diverged from one another. Thus, despite being correlated to a small to moderate degree (as shown in Table 4), measures of challenge stressors and challenge appraisal were distinct, as were measures of hindrance stressors and hindrance appraisal. Challenge appraisal was also associated with activated positive affect (consistent with H2a) and hindrance appraisal was associated with anger (consistent with H2b).

Path analyses were conducted with centered composite variables, for which 37-54% of variance occurred within-participants (as shown by the intra-class correlations in Table 4, confirming their suitability for multi-level analysis; Snijders & Bosker, 2012). In the first analysis (Model 2A), pathways were estimated from stressor variables to appraisal variables, and from stressor and appraisal variables to affect variables, with covariance modelled between error terms of mediator variables and outcome variables. The resulting model was just-identified (zero degrees of freedom), so fit could not be calculated directly. As shown in Table 5, challenge appraisals explained unique variance in activated positive affect (consistent with H4a), while hindrance appraisals explained unique variance in anger (consistent with H4b), even after accounting for direct effects of stressors. Consistent with hypothesis 5, there were also several indirect effects of stressors via appraisals on activated positive affect and anger. However, only two indirect pathways were significant at the within-person level: challenge stressors via challenge appraisals to activated positive affect (95% CI = .02 to .10, $p = .002$, consistent with H5a) and hindrance stressors via hindrance appraisals to anger (95% CI = .01 to .08, $p = .013$, consistent with H5b). These remained the strongest indirect effects at the between-person level.

A comparison model (Model 2B) was also tested in which all paths from appraisal variables to outcome variables were fixed at zero. Analyses showed that Model 2B did not fit as

well as model 2A ($\Delta\chi^2$ (8) = 190.29, $p < .001$). Compared to Model 2A, Model 2B explained considerably less variance in both activated positive affect (ΔR^2 = -.05 within, -.26 between) and anger (ΔR^2 = -.03 within, -.20 between). This highlights the utility of measuring appraisal even when stressors are already differentiated into challenges and hindrances. Also in Model 2B, as in the correlation matrix (shown in Table 4), higher levels of challenge stressors were associated with more activated positive affect, an effect that was only significant at the between-person level ($\beta = .26$, $p = .001$) and only when fixing the effects of challenge appraisal at zero. This demonstrates the potential for effects of challenge stressors to be misinterpreted where appraisal goes unmeasured, especially in cross-sectional research designs.

Study 2 showed that responses to the appraisal scales vary from one day to the next day indicative of reappraising changing work situations (including challenge and hindrance stressors) each day, and this daily variation in appraisals was associated with variation in affective states. Most findings were consistent with our predictions, supporting our assertion that measuring appraisal variables has utility in diary-style research on stressors and their effects.

Study 3

Our final study used a student population. This allowed us to obtain an independent rating of work performance to test the practical utility of measuring appraisal, while avoiding common-method variance problems in outcome measurement. This population also cross-validated our measures in another context (education), and let us examine stressors and appraisals relating to a common task. Focusing on the task level, in addition to the day-, event- or stressor-level, addressed calls for studying work phenomena at multiple levels of analysis (e.g., Parker, 2014).

Method

Participants and procedure.

We surveyed university undergraduates who had the same scientific report due within a

week of completing the survey. Of 520 students enrolled in an introductory psychology course, 350 completed at least 95% of the survey in class and were also willing to release their assignment results. Consistent with course demographics, most participants were female (69.1%) and most had English as their first language (82.8%). Ages ranged from 18 to 47 (M = 20.22, SD = 3.83). Excluded from the sample were 32 students (9% of the sample) whose surveys had missing data, because that missing data included at least one whole uncompleted scale.

Materials.

Challenge and hindrance appraisals were measured as in Studies 1 and 2, as shown in Table 1, with a focus on the impact of features of the upcoming assignment (as in the pilot study).

Challenge and hindrance stressors (α = .85 and .88 respectively) were measured as in Study 2, although items were framed to relate to the assignment. Factor analysis resulted in removing the same items as in Study 2, making the scales consistent across both studies.

Task-related affect was framed as feelings about the task. The same scales as in Studies 1 and 2 were used for anger (α = .87) and activated positive affect (α = .90).

Task performance (scored 0 to 25) was determined by tutors following a standard rubric.

Analysis.

Hypotheses were tested in MPlus using SEM. CFA was used to verify the appraisal factor structure and create a measurement model confirming the independence of study constructs. Predictive models were then used to assess relations from stressors and (or via) appraisals to affect and task performance variables. Mardia indices (sample values > 92) revealed multivariate non-normality in the data, so MLM estimation was used as in Study 1. Bootstrapping with 1000 samples was used to calculate confidence intervals for indirect effects. MPlus modelled available data to resolve 14 cases (4% of the sample) where 1-3 items were left blank.

Results and Discussion

As shown in Table 1, CFA showed good model fit for appraisal. It also supported a two-factor model for affect items (χ^2 (1) = 2.12, p = .145; CFI = 1.00, TLI = .99, RMSEA = .057, SRMR = .011), as in Study 2. Stressor scales were problematic, but the modifications used in Study 2 again led to adequate fit (χ^2 (62) = 180.40, p < .001; CFI = .94, TLI = .93, RMSEA = .074, SRMR = .078). The final measurement model fitted well (χ^2 (258) = 463.64, p < .001; CFI = .95, TLI = .94, RMSEA = .048, SRMR = .057), and all scales AVEs exceeded their MSVs, indicating that variables diverged from one another. As shown in Table 6, higher levels of challenge appraisal were associated with more task-related activated positive affect (consistent with H2a), and higher levels of hindrance appraisal were associated with more task-related anger (consistent with H2b).

For the predictive model (Model 3A), performance was included along with the three affect constructs as an outcome of stressors and appraisals. By including direct paths from stressors to appraisals, we could calculate indirect effects of stressors via appraisals. Model fit was good (χ^2 (278) = 511.30, p < .001; CFI = .95, TLI = .94, RMSEA = .049, SRMR = .063). As shown in Table 7, challenge appraisal was associated with task-related activated positive affect despite controlling for the effects of challenge and hindrance stressors, consistent with H3a. Hindrance appraisal was associated with anger, consistent with H3b. Challenge appraisal and hindrance stressors were associated with task performance, but hindrance appraisal and challenge stressors were not. Thus, those students who perceived the task to be challenging went on to perform better, while those who perceived they had encountered more hindrance stressors performed worse.

Table 7 also shows indirect effects of stressors on mood via appraisals, consistent with hypothesis 5. As predicted (H5a), challenge stressors appeared to influence both positive affect (95% CI = .08 to .28, p < .001) and task performance (95% CI = .01 to .17, p = .015) only via

challenge appraisals, with no direct relations observed between challenge stressors and these outcomes. Also as predicted (H5b), hindrance stressors appeared to influence anger at least partially via hindrance appraisals (95% CI = .04 to .18, $p < .001$). Hindrance stressors also appeared to influence positive affect, anger and task performance at least partially via challenge appraisal, suggesting that problems can emerge where hindrance stressors undermine a sense of challenge. No indirect effect was observed via hindrance appraisal on task performance, due to a lack of association between hindrance appraisal and performance.

A comparison model (Model 3B) was constructed in which paths from appraisal variables were set at zero; this did not fit as well as Model 3A ($\Delta\chi^2$ (6) = 84.45, $p < .001$). As shown in Table 7, Model 3B also explained less variance in activated positive affect, anger, and task performance than Model 3A. Finally, Model 3B showed a significant positive association between challenge stressors and activated positive affect ($\beta = .16$, $p = .004$), which was not present in Model 3A when controlling for challenge appraisal.

In relation to task performance, challenge appraisal may not be a conventional mediator, because challenge stressors were not associated with task performance in any model. Affect variables did not act as additional mediators, since these were also unrelated to task performance. The use of independent performance ratings means that this association cannot be attributed to common method bias. One possibility is that challenge appraisal was a suppressor variable, revealing a small (though non-significant) negative association between challenge stressors and performance. Such an effect would be consistent with research showing that cognitive overload in a learning task can impair performance (Sweller, 1988). Alternatively, this may reflect a methodological limitation whereby, at a functional level, the impact of challenge stressors on performance did not differ sufficiently between students beyond pre-existing differences in ability. Results showed less variation in perceived challenge stressors than in any other variable,

as shown in Table 6. Thus, challenge appraisal may have affected performance directly.

General Discussion

Research into the challenge—hindrance stress framework has relied largely on self-reports of work stressors that have been aggregated into researchers' *a priori* categorizations of challenge versus hindrance. This approach is inconsistent with Lazarus and Folkman's (1984) transactional model, which says that attitudes and behaviors arising from stressful situations can be positive or negative, depending on how those situations are appraised. Our paper describes three studies evaluating new measures of challenge and hindrance appraisals, and demonstrates not only their validity but also their utility in research into the effects of stressors.

A key contribution of this work is the development and validation of valid, reliable measures of challenge and hindrance appraisal. The scales were designed to assess growth and achievement aspects of anticipated personal gains (challenge appraisal) and obstacles (hindrance appraisal). The scales fit a two-factor structure and showed similar factor loadings, reliability levels, and inter-correlations in three studies with different populations, designs, levels and foci, suggesting that scales have equivalent meaning in a wide variety of contexts. Moreover, evaluations of construct validity suggested the scales measure what they were designed to measure. Study 1 showed they were associated with other challenge and hindrance appraisal measures, consistent with hypothesis 1. Consistent with hypothesis 2, all studies showed that challenge appraisal was associated with activated positive affect, while hindrance appraisal was associated with anger.

Our studies demonstrate several reasons why appraisal should be considered in research into stressors and their effects. Firstly, self-reports of stressors fell short of capturing individuals' experiences of challenge and hindrance. Studies 2 and 3 showed that relatively little variance was shared between stressor categories and appraisals (especially for challenge, where no more than

10% of variance was shared). Given our difficulties in achieving fit with measures of stressor categories, one could assume this is partly due to combining within a category scale a wide variety of work characteristics, each of which may be appraised differently. However, specific stressor measures may not resolve the problem, as Study 1 showed that a specific stressor (time pressure) was appraised as a hindrance to the same degree as it was appraised as a challenge. Thus in order to speculate about how people appraise a stressor, task, or work situation, we may have to measure appraisals rather than infer them from stressor measures.

Furthermore, consistent with hypotheses 3 and 4, appraisal variables explained unique variance in outcome measures. Over and above the effects of challenge and hindrance stressors, information about challenge and hindrance appraisal appears to be useful for understanding affective states, coping behaviors, and even task performance. In contrast to Webster et al. (2011), who found challenge appraisal explained little unique variance in negative work outcomes, our studies indicate that while hindrance appraisal generally influenced negative outcomes, challenge appraisal generally influenced positive ones. In some cases, including appraisals in the model helped to highlight the potentially negative consequences of challenge stressors.

Appraisal also appeared to mediate the effects of stressors on some outcomes, consistent with hypothesis 5. However, although appraisals were focus-specific and varied within people, and although challenge appraisal was related to a subsequent, independent performance measure, our methods were not sufficient to establish causal links from stressors to appraisals to outcomes. Laboratory studies and longitudinal designs are necessary to establish such causal relations.

Nevertheless, our findings have important conceptual and practical implications. Conceptually, simple models of the effects of stressors are likely to be improved by including appraisal variables, even when the appraisal variables seem to duplicate the stressor constructs

(as with challenge and hindrance stressors). Measuring appraisal in stress research may reveal important effects otherwise missed or misunderstood. Practically, our findings suggest that challenge stressors may promote more productive coping and work outcomes, but that they may only do so to the extent that the stressors are appraised as challenging. Interventions that increase challenge stressors actually have the potential to be counterproductive. Future research could investigate the role of challenge appraisals in interventions, or indeed as a focus of interventions.

Nevertheless, this paper extends research on the challenge-hindrance framework. We have validated our scales across a variety of populations, contexts and stress-inducing phenomena, and shown them to vary from one day to the next, consistent with dynamic appraisal of changing situations. Using these scales, we demonstrated that even when controlling for the effects of perceived challenge and hindrance stressors, appraisals of challenge and hindrance contribute to the prediction of affective and behavioral stress responses, and even task performance. We therefore encourage researchers to consider carefully the manner in which appraisal plays a part in the stress process over and above the perceived or actual levels of situational stressors.

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Appendix

Appraisal Scales

Framing

Appraisal scales must be framed in relation to an event or situation (and/or a time frame in which events may occur), so that respondents all understand what they are appraising.

Event example: Think about something that happened today, preferably in the last hour or two, which affected how you feel. Please now assess how the event is likely to affect you.

Stressor example: Think about the amount of time pressure you are experiencing today. Please now assess how this time pressure is likely to affect you.

Task example: Think about the task you are currently performing. Please now assess how this task is likely to affect you.

Challenge items

It/They will help me to learn a lot

It/They will make the experience educational

It/They will show me I can do something new

It/They will keep me focused on doing well

Hindrance items

It/They will hinder any achievements I might have

It/They will restrict my capabilities

It/They will limit how well I can do

It/They will prevent me from mastering difficult aspects of the work

Response options

Participants respond on a scale from 1 (strongly disagree) to 5 (strongly agree).

Table 1.

Internal Consistencies, Confirmatory Factor Analysis Loadings, and Fit Indices for Appraisal Scales, by Study and Focus/Level.

Appraisal scale and items for each study	Study 1		Study 2		Study 3
	Recent event	Time pressure	Level 1 (within)	Level 2 (between)	Task
Challenge Appraisal	*α = .93*	*α = .94*	*α = .83*	*α = .96*	*α = .80*
It/They will help me to learn a lot	.97	.96	.87	.95	.72
It/They will make the experience educational	.90	.95	.79	.93	.75
It/They will show me I can do something new	.89	.90	.75	.92	.70
It/They will keep me focused on doing well	.76	.76	.75	.85	.61
Hindrance Appraisal	*α = .95*	*α = .95*	*α = .88*	*α = .97*	*α = .90*
It/They will hinder any achievements I might have	.89	.90	.75	.95	.78
It/They will restrict my capabilities	.92	.92	.72	.93	.84
It/They will limit how well I can do	.95	.90	.78	.96	.90
It/They will prevent me from mastering difficult aspects of the work	.90	.95	.67	.95	.83
Fit Indices (Two Factor Models)					
Chi-Square value (*df* = 19)	44.00	28.72	26.43	44.22	27.55
Chi-Square significance (*p*)	.001	.071	.119	.001	.093
Confirmatory fit index	.99	.99	.98	.98	.99
Tucker-Lewis index	.98	.99	.97	.98	.99
Root-mean-square error of approximation	.063	.039	.027	.040	.036
Standardized root-mean-square residual	.026	.030	.041	.025	.024

Table 2.

Correlations between Study 1 Variables Relating to a Recent Event (Above Diagonal) and the Day's Time Pressure (Below Diagonal).

Statistic / Variable	M	SD	1	2	3	4	5	6
Mean (M)			3.03	2.19	1.93	1.86	2.77	2.02
Standard deviation (SD)			1.09	1.07	1.10	1.04	0.89	0.91
1. Challenge appraisal	3.06	1.08		-.06	.52***	-.14*	.34***	-.07
2. Hindrance appraisal	2.26	1.06	-.07		-.12*	.44***	.05	.41***
3. Activated positive affect	1.96	1.16	.47***	-.10		-.11*	.19***	.00
4. Anger	1.58	0.91	-.06	.46***	.06		.19***	.47***
5. Problem-focused coping	2.58	0.91	.43***	.11*	.29***	.17**		.32***
6. Venting	1.86	0.91	.03	.51***	.10	.52	.36***	
7. Time pressure	3.18	1.15	.25***	.26***	.21***	.29***	.37***	.34***

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

Table 3.

Standardized Direct and Indirect Effects from Structural Equation Models of Recent Event and Daily Time Pressure, Study 1.

Variable	Challenge appraisal	Hindrance appraisal	Activated positive affect	Anger	Problem-focused coping	Venting
Model 1A: Direct effects of appraisal of recent events						
Challenge appraisal – direct	–	–	.57***	-.12*	.37***	-.05
Hindrance appraisal – direct	–	–	-.09	.47***	.08	.46***
Model 1A R^2	–	–	.34***	.24***	.14***	.22***
Model 1B: Direct and indirect effects of time pressure and appraisal of time pressure						
Time pressure – direct	.25***	.27***	.15**	.23***	.29***	.25***
Challenge appraisal (CA) – direct	–	–	.46***	-.10	.37***	-.01
Hindrance appraisal (HA) – direct	–	–	-.11*	.43***	.06	.50***
Time pressure – indirect, via CA	–	–	.11***	-.02	.09***	.00
Time pressure – indirect, via HA	–	–	-.03	.12***	.02	.14***
Model 1B R^2	.06*	.08*	.27***	.29***	.29***	.38***
Model 1C: Direct effects of time pressure when appraisal effects are fixed to zero						
Time pressure – direct	.25***	.28***	.23***	.32***	.40***	.39***
ΔR^2 from Model 1B	.00	.00	-.21***	-.18***	-.13***	-.23***

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

Table 4.

Correlations between Study 2 Variables at Within-Person (Above Diagonal) and Between-Person (Below Diagonal) Levels.

Statistic / Variable	M_1	SD_1	ICC	1	2	3	4	5	6
Standard deviation (SD_2)				.47	.46	.48	.44	.56	.52
1. Challenge appraisal	3.40	.71	.57		-.13***	.24***	.03	.22***	-.06
2. Hindrance appraisal	2.18	.74	.60	-.37***		.09**	.24***	-.07*	.21***
3. Challenge stressors	3.23	.62	.46	.31***	.02		.33***	.07*	.17***
4. Hindrance stressors	2.38	.62	.52	-.02	.52***	.38***		.01	.22***
5. Activated positive affect	2.72	.93	.63	.54***	-.36***	.19**	-.08		.01
6. Anger	1.54	.71	.51	-.32***	.53***	.19**	.41***	-.24***	

Notes: $_1$ between-person statistics; $_2$ within-person statistics. ICC: Intra-class correlation.

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

Table 5.

Standardized Direct and Indirect Effects from Multilevel Path Model 2A, Study 2.

Variable/Effect	Challenge appraisal	Hindrance appraisal	Activated positive affect	Anger
Within-person effects				
Challenge stressors – direct	.25***	.02	.03	.13*
Hindrance stressors – direct	-.05	.23***	.01	.14**
Challenge appraisal (CA) – direct			.20***	-.07
Hindrance appraisal (HA) – direct			-.05	.16**
Challenge stressors – indirect, via CA			.05**	-.02
Challenge stressors – indirect, via HA			.00	.00
Hindrance stressors – indirect, via CA			-.01	.00
Hindrance stressors – indirect, via HA			-.01	.04*
Within-person R^2	.06*	.06*	.05*	.09**
Between-person effects				
Challenge stressors – direct	.38***	-.20**	.05	.21**
Hindrance stressors – direct	-.17	.60***	.02	.14
Challenge appraisal (CA) – direct			.45***	-.24***
Hindrance appraisal (HA) – direct			-.20**	.36***
Challenge stressors – indirect, via CA			.17***	-.09**
Challenge stressors – indirect, via HA			.04*	-.07*
Hindrance stressors – indirect, via CA			-.08	.04
Hindrance stressors – indirect, via HA			-.12**	.22***
Between-person R^2	.12**	.30***	.32***	.37***

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

Table 6.

Correlations between Study 3 Variables.

Variable	M	SD	1	2	3	4	5	6
1. Challenge appraisal	3.68	.63						
2. Hindrance appraisal	2.39	.80	-.39***					
3. Challenge stressors	3.85	.59	.28***	.06				
4. Hindrance stressors	2.69	.73	-.34***	.50***	.18***			
5. Activated positive affect	2.05	.92	.44***	-.20**	.13*	-.16**		
6. Anger	3.10	1.11	-.37***	.43***	.17**	.43***	-.16**	
7. Task performance	16.94	2.85	.23***	-.12*	-.04	-.25***	.10	-.14*

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

Table 7.

Standardized Direct and Indirect Effects from Structural Equation Models 3A and 3B, Study 3.

Variable	Challenge appraisal	Hindrance appraisal	Activated positive affect	Anger	Task performance
Model 3A: Direct and indirect effects of challenge and hindrance stressor and appraisal variables					
Challenge stressors – direct	.37***	.01	-.02	.23***	-.10
Hindrance stressors – direct	-.39***	.47***	.03	.14*	-.15*
Challenge appraisal (CA) – direct	–	–	.48***	-.28***	.24**
Hindrance appraisal (HA) – direct	–	–	-.02	.24***	.05
Challenge stressors – indirect, via CA	–	–	.18***	-.11**	.09*
Challenge stressors – indirect via HA			.00	.00	.00
Hindrance stressors – indirect via CA	–	–	-.19***	.11**	-.10**
Hindrance stressors – indirect via HA			-.01	.11***	.02
Model 3A R^2	.26***	.22***	.23***	.29***	.09**
Model 3B: Direct effects of stressor variables only, with appraisal effects excluded					
Challenge stressors – direct effect	.37***	.01	.16**	.12*	-.01
Hindrance stressors – direct effect	-.39***	.47***	-.17**	.36***	-.22***
ΔR^2 from Model 3A	.00	-.01	-.17**	-.12**	-.04*

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