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## RESEARCH ARTICLE

# How does day-to-day stress appraisal relate to coping among office workers in academia? An ecological momentary assessment study

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**Funding information**

Fonds Wetenschappelijk Onderzoek, Grant/Award Number: G.0318.18N; Javna Agencija za Raziskovalno Dejavnost RS, Grant/Award Number: N2-0081

**Abstract**

Existing literature indicates that academic staff experience increasing levels of work stress. This study investigated associations between day-to-day threat and challenge appraisal and day-to-day problem-focused coping, emotion-focused coping, and seeking social support among academic office workers. This study is based on an Ecological Momentary Assessment (EMA) design with a 15-working day data collection period utilising our self-developed STRAW smartphone application. A total of 55 office workers from academic institutions in Belgium ( $n = 29$ ) and Slovenia ( $n = 26$ ) were included and 3665 item measurements were analysed. Participants were asked approximately every 90 min about their appraisal of stressful events (experienced during the working day) and their coping styles. For data analysis, we used an unstructured covariance matrix in our linear mixed models. Challenge appraisal predicted problem-focused coping and threat appraisal predicted emotion-focused coping. Our findings suggest an association between threat appraisal as well as challenge appraisal and seeking social support. Younger and female workers chose social support more often as a coping style. While working from home, participants were less likely to seek social support. The findings of our EMA study confirm previous research on the relationship between stress appraisal and coping with stress. Participants reported seeking social support less while working from home compared to working at the office, making the work location an aspect that deserves further research.

**KEYWORDS**

academic setting, coping, day-to-day work stress, ecological momentary assessment (EMA), office workers, stress appraisal

## 1 | INTRODUCTION

### 1.1 | Occupational stress in academia

While employment can have positive effects on workers' well-being and prosperity (Siegrist & Rödel, 2006) as it provides structure and a purpose in life (Bakker & de Vries, 2021), work has proven to be a major source of stress (Siegrist & Rödel, 2006). Due to work demands and work pressure, occupational settings gain increasing attention as an important source of psychological stress, potentially leading to impaired mental health outcomes and adverse psychological well-being (Chu et al., 2014). In Europe, just over half of the workers report stress as common in their workplace, making it the second most frequently reported health-related problem at work, right after musculoskeletal disorders (Alberdi et al., 2016).

In comparison to other professions academic work used to be regarded as less stressful (Kinman, 2001; Opstrup & Pihl-Thingvad, 2016). Academic freedom and tenure were considered protecting factors against occupational stress (Gillespie et al., 2001; Opstrup & Pihl-Thingvad, 2016), and academics were envied for their light workloads, flexibility in organising their work, and freedom to perform research within their fields of interest (Gillespie et al., 2001). However, research indicates that academic staff experience high to very high levels of work stress (Du Plessis & Martins, 2019; Gillespie et al., 2001; Opstrup & Pihl-Thingvad, 2016) with a continuously increasing trend (Adriaenssens et al., 2006; Gillespie et al., 2001). The increasing workload for academics is caused by experiencing growing pressure to raise external funds, to frequently publish research (Gillespie et al., 2001), to keep up with rapidly advancing technologies, and to adapt to continuously changing curricula and quality assurance measures (Du Plessis & Martins, 2019). In addition, the student/staff ratio is increasingly rising over the years without proportionate funding for more staff (Cox et al., 2000; Du Plessis & Martins, 2019; Gillespie et al., 2001; Kinman, 1998). Based on previously published research, stressors experienced in academia will continuously increase if no mechanisms and strategies are adopted to cope with these job demands (Darabi et al., 2017).

### 1.2 | Stress and stress appraisal

In the Cognitive Transactional Model of Stress and Coping, Lazarus and Folkman (1984) describe stress as '*a particular relationship between the individual, and the environment that is appraised by the individual as taxing or exceeding his or her resources, and endangering his or her well-being*'. In this model, stress is not only considered as a process of appraising personal or environmental factors but also as an interaction between the individual and the environment (Lazarus & Folkman, 1984).

Lazarus and Folkman (1984) distinguish three phases in their model - primary appraisal, secondary appraisal, and coping (the latter is described in the following section). The primary appraisal is when the individual has an initial reaction to the stimulus/stressor and

perceives it as either a negative or a positive situation. This primary appraisal depends on (1) the psychosocial aspects of the individual such as personality traits, values, and motivation, and (2) the situational context, such as the timing of the event or degree of familiarity with such a situation (Durak, 2007). The secondary appraisal co-occurs with the primary appraisal, during which the individual evaluates his or her resources or abilities to deal with the stressful situation. Moreover, during the primary and secondary appraisal, the individual determines whether a situation is perceived as mainly challenging (i.e., the stressful situation is appraised as relevant and poses a challenge that one can overcome) or threatening (i.e., the stressful situation is also appraised as relevant, but it poses a threat to one's well-being and development) (Lazarus & Folkman, 1984). The model has been used for decades and remains one of the most applicable and widely used theoretical concepts in the field (Anshel et al., 2001; Durak, 2007; Zhang et al., 2019).

Using the Cognitive Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) as a conceptual basis, the challenge-hindrance stressor framework (Cavanaugh et al., 2000) was developed. In essence, the model proposes that comprehending the impact of stressors involves taking into account people's typical ways of thinking and feeling about them. This model includes challenge stressors, that is, when an individual appraises work demands as situations that have potential positive outcomes such as rewards, achievement, and personal growth. Although challenge stressors, such as responsibilities and time pressure can cause strain, they often result in positive job attitudes and behaviours. Its counterpart, hindrance stressors, are described as situations disturbing personal growth and positive outcomes, which can manifest in negative behaviours and job attitudes. Role conflict and role ambiguity are examples of such stressors (Bennett et al., 2021; Cavanaugh et al., 2000; LePine, 2022; Zhang et al., 2019).

### 1.3 | Coping with stress

Lazarus and Folkman describe coping, the last phase of the Cognitive Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), as '*the cognitive and behavioural efforts made to master, tolerate, or reduce external and internal demands and conflicts among them*' (Folkman & Lazarus, 1980). While stress is inevitable, the difference in outcomes between people is how they cope with the experienced stress (Lazarus & Folkman, 1984; Rodrigues et al., 2017), trying to manage the unpleasant stressful situation and the emotions caused by it (Lazarus & Folkman, 1984). If the coping is successful, the individual has managed to reduce the negative reactions to the threat (Cox et al., 2000). While a situation in itself is not stressful, the interaction between the individual and the situation (Fortes-Ferreira et al., 2006; Rodrigues et al., 2017) and the person's appraisal and coping determine the outcome of the situation (Fortes-Ferreira et al., 2006; Zhang et al., 2019). The process of appraisal and coping is often seen as a linear process with first an event, followed by the primary appraisal, the secondary appraisal, and lastly coping.

However, in the process of appraisal and coping, a part of the process can have an impact on an earlier part of the process, meaning the process can be iterative (Carver et al., 1989; Scherer et al., 1993). For instance, realising that one has an adequate coping response can make one appraise the stressful event as less threatening (Carver et al., 1989). Another Ecological Momentary Assessment (EMA) study looking into dynamics between appraisal and core affect in day-to-day life confirmed these findings by showing that moods and emotions are not static but dynamic experiences, which tend to interact (Kuppens et al., 2012).

Folkman and Lazarus (1980) made a distinction between two types of coping in the Cognitive Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), depending on how the situation is appraised (Jang et al., 2019; Zhang et al., 2019). One type is problem-focused coping based on solving problems and handling stressful situations, which is most often used when people feel they can actively do something about the situation, appraising the situation as controllable (Troy, 2015), and the other type is emotion-focused coping based on dealing with the emotions evoked by stressful situations, which is applied when people feel they must undergo the stressful situation and when the situation is appraised as uncontrollable (Jang et al., 2019; Lazarus & Folkman, 1984).

When a stressful situation is appraised as challenging but controllable, the individual engages in actions reducing stress, which is problem-focused coping. This has been confirmed by a previous EMA study, showing that challenge appraisal in the form of higher momentary stress intensity, experienced as controllable, was related to the higher use of problem-focused coping (Socastro et al., 2022). When an individual appraises a stressful situation as threatening and uncontrollable, the actions are focused on reducing or managing the stressful emotions caused by the situation, which is emotion-focused coping (Anshel et al., 2001). Different studies show that challenge appraisal is associated with problem-focused coping while threat appraisal is associated with emotion-focused coping (Anshel et al., 2001; Durak, 2007).

Another relevant coping strategy is seeking social support, either for instrumental or emotional reasons. Instrumental support includes assistance, getting information, or seeking advice, which can be seen as a proactive form of coping. Emotional support, on the other hand, includes understanding, sympathy, and moral support from others, which is more of an emotional coping strategy. While there are certain connections to the abovementioned problem-focused and emotion-focused coping styles, social support has been argued to be conceptually different enough to be handled as a standalone coping category (Carver et al., 1989).

## 1.4 | Research aim

This study contributes to the existing literature in several ways. First, this paper focuses on highly repeated day-to-day measures based on EMAs instead of capturing chronic exposures and outcomes. With day-to-day measures, we aimed to capture fluctuations of appraisal

and coping, compared to large-scale cohort studies focusing on chronic phenomena and solely one or two measurements. Additionally, EMAs are used in real-time and in real-world work environments, compared to artificially created stress experiences in lab studies. Second, we focused on office workers in academia, an occupational group known to be exposed to stressful experiences at work, which has been underrepresented in occupational stress studies. Third, we conducted a comprehensive analysis of the relationship between stress appraisal and coping by including seeking social support for instrumental and emotional reasons. Based on previous research, social support at work is essential in the experience of work stress (Calnan et al., 2004; van der Doef & Maes, 1999) as it is suggested by the Job Demand-Control-Support model (JDCS) (van der Doef & Maes, 1999). However, to our knowledge, the relationship between appraisal and coping has only been studied for problem-focused coping and emotion-focused coping (Anshel et al., 2001; Jang et al., 2019), but not for seeking social support as a standalone coping category, which presents a shortcoming in the existing literature.

The research aim was to assess whether day-to-day stress appraisal impacts coping, by investigating the relations between (a) the two concepts of threat appraisal and challenge appraisal and (b) the three concepts of problem-focused coping, emotion-focused coping, and seeking social support among office workers in academia.

## 2 | METHODS

The reporting of this study is based on the STROB Statement (von Elm et al., 2007) for observational research. We included three different data collection methods in the STRAW project, but this paper is focusing on data collected via EMAs. The complete protocol of the STRAW project can be found in our protocol paper (Bolliger et al., 2020).

### 2.1 | Participants, recruitment, and eligibility criteria

The participants in the STRAW project were all healthy employees having sedentary office jobs and working in academic settings of two institutions in Belgium and Slovenia. The study sample included 55 participants consisting of 29 office workers in Belgium and 26 in Slovenia. Participants were recruited via convenience sampling based on widespread information distribution, such as internal communication platforms, printed flyers distributed across campuses, and personal communication with colleagues and acquaintances. Participants were recruited from October 2019 to June 2021 (Bolliger et al., 2020). To be included in the study, participants needed to have an Android smartphone and work between 80% and full-time. In addition, participants had to agree to instal our self-developed STRAW app on their smartphones for data collection and needed oral permission from their supervisors, since most of the data collection took place during working hours.

## 2.2 | Study design, EMA protocol, and data collection procedure

The STRAW project is based on an intensive longitudinal study using EMAs implemented in our STRAW app. EMAs allow participants to answer questions in real-time and in real-world occupational settings, comparable to an electronic daily diary (Bolliger et al., 2020). We slightly adapted the wording of the included items from the original questionnaires to make them suitable to be asked repeatedly. We developed the EMA protocol in English and made it afterwards available to our participants in Dutch and Slovenian.

Based on our triggering protocol, we implemented a semi-random sampling scheme (Kirtley et al., 2021), meaning during the day participants received approximately every 90 min an EMA consisting of approximately 20 items, starting 30 min into their working day at the earliest until they reported to be done with work. If participants either did not respond to the EMA or swiped it away, they would receive a reminder after 15 min. Participants had the chance to answer the EMA for up to 90 min after the initial triggering before it would expire and a new EMA would appear.

During these working time EMAs, they were asked if they experienced a stressful event since they started working or since the last EMA. If the answer was yes, they received four further questions about the appraisal of the stressful event. Two questions measured threat appraisal, that is, whether participants experienced the stressful event as something that could have a negative impact. The other two questions measured challenge appraisal, that is, whether the stressful event could have a positive outcome. If they did not experience a stressful event, they were asked about the stressfulness of the overall period since they started working or since the last EMA.

In addition to these working time EMAs, the STRAW app also included evening EMAs, which were triggered at a time of the participants' choosing and included approximately 40 items including questions about the participants' coping styles (Bolliger et al., 2020).

Our data collection procedure consisted of three steps: (1) online baseline screening and briefing (on the first day of data collection), (2) EMA data collection period for 15 consecutive working days (excluding weekends and days off), and (3) debriefing (on the last day of data collection). We tested the data collection procedure during a pilot study with five colleagues at Ghent University for three consecutive weeks in February and March 2020. The data collection with the main participant cohort took place from October 2020 to June 2021.

## 2.3 | Impact of the Covid-19 pandemic

Due to the outbreak of the Covid-19 pandemic, our data collection had to be postponed from March 2020 until a slow start in October 2020, finalising in June 2021. Originally, only participation during work at the participants' office was allowed using our STRAW smartphone application. However, due to the ongoing home office policy, we improved our approach, enabling data collection during work from home or any other location outside of the office. This

adaptation allowed for a more inclusive data collection procedure, which was then selected as a co-variable during the analysis stage. Moreover, using participants' smartphones as the primary data collection tool was suitable for such circumstances. Our protocol adaptations and the use of a self-developed smartphone application, which allowed ad hoc changes, enriched our final dataset in qualitative and quantitative aspects, making it more suitable for the increasingly common remote work culture in academia.

## 2.4 | Data collection materials

To measure how participants appraised stress, questions from the Stress Appraisal Measure (SAM) were included in the working time EMAs and were asked repeatedly during the day (Bolliger et al., 2020). The SAM is a validated and reliable measurement tool, Cronbach's  $\alpha$  coefficients for threat ( $\alpha = 0.75$ ) and challenge ( $\alpha = 0.79$ ) (Peacock & Wong, 1990). No Dutch or Slovenian translations of the SAM were available, therefore native speakers and a professional translator applied the back-translation method based on the English original. The STRAW app randomly selected for each EMA two questions out of four questions concerning threat and two questions out of four questions concerning challenge. An example of the SAM is: 'How threatening was this event?' preceded by 'Since you started working today/since the last questionnaire'. Participants answered on a Likert scale ranging from 0-'Not at all', 1-'Slightly', 2-'Moderately', 3-'Considerately', to 4-'Extremely'.

To see which type of coping the participants used, questions from the COPE Inventory (Carver et al., 1989) were included in the evening EMAs and were asked once a day (Bolliger et al., 2020). For the Dutch version, the COPE-Easy, a validated and reliable translation of the COPE Inventory was used, Cronbach's  $\alpha$  coefficients for active coping ( $\alpha = 0.77$ ), planning ( $\alpha = 0.89$ ), focus on and venting of emotions ( $\alpha = 0.82$ ), seeking social support for emotional reasons ( $\alpha = 0.83$ ), and seeking social support for instrumental reasons ( $\alpha = 0.82$ ) (Kleijn et al., 2000). For the Slovenian version, an official translation applied in previous research was used, Cronbach's  $\alpha$  coefficients for active coping ( $\alpha = 0.43$ ), planning ( $\alpha = 0.69$ ), focus on and venting of emotions ( $\alpha = 0.59$ ), seeking social support for emotional reasons ( $\alpha = 0.88$ ), and seeking social support for instrumental reasons ( $\alpha = 0.76$ ) (Avsec et al., 2012). To reduce the participant burden, only the questions from the subscales active coping and planning (combined as problem-focused coping), focus on and venting of emotions (emotion-focused coping), and seeking social support for either emotional or instrumental reasons were included, as these types of coping were considered most relevant for this study (Bolliger et al., 2020). Based on the developers of the original English version of the COPE Inventory and their performed factor analysis, the items of the active coping subscale and planning subscale did not load separately from each other as distinct factors. The same goes for the items of the seeking social support for emotional reasons subscale and seeking social support for instrumental reasons subscale. Hence, these subscales are not fully distinct from one another, invariably accompany each other, and are

therefore unproblematic to be merged (Carver et al., 1989). The STRAW app randomly selected for each EMA two questions for problem-focused coping, emotion-focused coping, and seeking social support out of a pool of eight, four, and eight questions, respectively. An example of the COPE Inventory is: 'I tried to get advice from someone about what to do' preceded by 'How did you handle stressful situations occurring at work today?'. Participants answered on a Likert scale ranging from 0-'I didn't do this at all', 1-'I did this a little bit', 2-'I did this a medium amount', to 3-'I did this a lot'.

The items about age, gender, country, and job category were part of the online baseline screening, and the job category was assessed with an open-answer format. Work location was included in the evening EMAs and was asked once a day. It was assessed with the following question: 'Where did you do your work?' with the answer options 'At the office', 'At home', 'I moved from between the office and home', or 'Other'.

## 2.5 | Data analysis

### 2.5.1 | Variables

For the threat and challenge appraisal, we chose to calculate the daily sum scores weighed by the number of times the participants completed working time EMAs that day, instead of calculating daily averages (Table 1). This approach was equivalent to assigning 0 for both threat and challenge when there was no stressful event

reported. This method was chosen as it gave a more accurate picture of the appraisals during the day compared to averages. For example, if a participant indicated having one stressful event during the day indicating a score of 2 on threat appraisal, that would give an average score of 2 for that day. However, if another participant had multiple stressful events during a day indicating a score of 2, 1, and 1, this would create an average of 1.33. Based on these averages the first participant experienced more stress. However, in reality, the second participant experienced more stress, as this participant experienced three stressful events instead of one.

The variables problem-focused coping, emotion-focused coping, and seeking social support were (1) averaged over the two randomly selected items per EMA and (2) averaged over the day.

Age (in years), gender, country (Belgium or Slovenia), and job category were included as time-fixed covariates in the analysis. We grouped the participants into three job categories: (1) administrative and technical staff, (2) researchers without a PhD, and (3) researchers with a PhD. Work location was included as a time-varying covariate in the analysis. We categorised the results into two categories, either 'At home' or 'Non-home'.

### 2.5.2 | Statistical analysis

The original dataset included 57 participants. One person participated throughout the main data collection period but did not

TABLE 1 Descriptive results of the study sample ( $N = 55$ ).

Time-fixed variables		Mean (SD)	N (%)
Demographic data	Age (in years)	34.2 (9.7)	
	Gender	Male	29 (53)
		Female	26 (47)
	Country	Slovenia	26 (47)
Belgium		29 (53)	
Job category	Admin and technical staff	15 (27)	
	Researchers without a PhD	26 (47)	
	Researchers with a PhD	14 (26)	
Time-varying variables		Mean (SD)	N (%)
Work location	At home		384 (57)
	Non-home <sup>a</sup>		286 (43)
N of stressful events per day		0.9 (1.2)	
Daily threat appraisal	[Likert scale: 0–4]	0.4 (0.8)	
Daily challenge appraisal	[Likert scale: 0–4]	0.5 (0.9)	
Daily problem-focused coping	[Likert scale: 0–3]	1.7 (0.9)	
Daily emotion-focused coping	[Likert scale: 0–3]	0.4 (0.6)	
Daily seeking social support	[Likert scale: 0–3]	0.7 (0.8)	

Abbreviations: number of item measurements, 3665; SD, standard deviation.

<sup>a</sup>Non-home: Participants did not work exclusively at home on the questioned day. They either worked partially at home, worked at their office, or worked at a third location.

complete the online baseline screening. Another person withdrew participation due to a lack of time for further participation after completing the online baseline screening. Consequently, these two participants were excluded from the final dataset and the data of 55 participants were analysed. All of these 55 participants completed the online baseline screening and at least 15 working days of EMA data collection. None of the participants dropped out between briefing and debriefing. Participant adherence was high with 3665 item measurements about appraisal and coping originating from the completed EMAs and only 4.5% missing item measurements (55 missing item measurements per coping style, i.e., 165 in total, and no missing item measurements of stress appraisal), similar to the overall STRAW project with only 4.2% incomplete EMAs (Lukan et al., 2021).

We included two levels of clustered data: first, repeated assessments per day, and second, nested within participants. We tested linear associations between our two independent variables, that is, threat and challenge appraisal, and our three dependent variables, that is, problem-focused coping, emotion-focused coping, and seeking social support. We applied fixed-effect model testing using repeated measurements within each participant as their own control. Furthermore, we chose random-intercept modelling over random-slope modelling. First, we did not aim to model any changes over time. Second, we did not assume that the associations between stress appraisal and coping would be different between participants. Third, a random-intercept model is more robust for our sample size of 55 participants.

To choose the most suitable model, we constructed histograms and QQ plots (depicting the distribution of residual terms) to visually inspect our variables and to check the assumptions of normality and homoscedasticity, in which residual terms were plotted against model-predicted values. Both assumptions were confirmed. Additionally, we tested the sensitivity of our results by testing a time trend on day-level to see if an increasing or decreasing trend in coping could be observed throughout the 15-day data collection period. We applied this sensitivity analysis to check for a potential learning effect over time since the participants got used to the EMA protocol throughout their participation period. To test for such a time trend, individual linear regression slopes were calculated.

In model 1 we focused on crude associations between our independent and dependent variables. In model 2 we added the five covariates for confounder effect testing, which were chosen based on comparative literature.

All analyses were performed utilising SPSS (version 28) with statistical significance determined at  $p < 0.05$  (Kuznetsova et al., 2017).

### 3 | RESULTS

#### 3.1 | Descriptive results

The descriptive results of the study sample can be found in Table 1. The age of the participants varied from 24 to 62 years old with a

mean age of 34.2 years ( $SD = 9.7$  years). We included 29 Belgian and 26 Slovenian participants, 26 of them being women (47%) and 29 being men (53%). Out of the 55 participants, 15 worked as administrative and technical staff (27%), 26 were researchers without a PhD (47%), and 14 were researchers with a PhD (26%).

All results of the time-varying variables in Table 1 were calculated for the whole study sample across the complete data collection period. Participants indicated to have worked about 57% of the time at home and about 43% in non-home locations such as their office, or a third location, or that they transferred between several locations. The number of stressful events per day ranged from 0 to 6, with a mean of 0.9 ( $SD = 1.2$ ). Stressful events were appraised as approximately equally threatening as challenging (0.4,  $SD = 0.8$  vs. 0.5,  $SD = 0.9$ ). Problem-focused coping was used most often with a mean value of 1.7 ( $SD = 0.9$ ), compared to emotion-focused coping (0.4,  $SD = 0.6$ ), and seeking social support (0.7,  $SD = 0.8$ ).

#### 3.2 | Inferential results

The Intraclass Correlation Coefficient (ICC) was calculated to acquire the proportion of variance in coping explained by the clustering structure of the study sample. The ICC ranges from 0 (clustering provides no information) to 1 (substantial variability between clusters). The ICCs were 0.41 for problem-focused coping, 0.23 for emotion-focused coping, and 0.20 for seeking social support. This implies that high percentages of the total variance in coping are due to within-person variance, with 59% for problem-focused coping, 77% for emotion-focused coping, and 80% for seeking social support.

The results of the random-intercept models are presented in Table 2.

As shown in model A1, a positive association was found between challenge appraisal and problem-focused coping ( $\beta = 0.14$ ,  $p < 0.001$ ). In model A2, where the covariates were added to the model, the significant association between challenge appraisal and problem-focused coping remained ( $\beta = 0.13$ ,  $p < 0.01$ ). As presented in model A2, the country of participation had a significant effect, since Belgium reported less problem-focused coping compared to Slovenia ( $\beta = -0.44$ ,  $p < 0.01$ ). No significant association was found between threat appraisal and problem-focused coping.

Model B1 shows that there is a positive association between threat appraisal and emotion-focused coping ( $\beta = 0.21$ ,  $p < 0.001$ ). When the covariates were added to the model, the significant association between threat appraisal and emotion-focused coping remained ( $\beta = 0.24$ ,  $p < 0.001$ ), which can be seen in model B2. No significant association was found between challenge appraisal and emotion-focused coping and none of the covariates were significant in the models of emotion-focused coping.

As shown in model C1, a positive association was found between challenge appraisal and seeking social support ( $\beta = 0.09$ ,  $p < 0.05$ ), an association that was no longer significant when the covariates were added. However, model C2 including the covariates shows a positive association between threat appraisal and seeking social support

TABLE 2 Random-intercept models of the associations between stress appraisal and coping.

	Fixed-effect regression coefficient (95% CI)					
	Problem-focused coping		Emotion-focused coping		Seeking social support	
	Model A1	Model A2	Model B1	Model B2	Model C1	Model C2
Independent variables						
Threat	-0.01 (-0.10; 0.08)	0.01 (-0.08; 0.11)	<b>0.21 (0.15;0.28)***</b>	<b>0.24 (0.18;0.31)***</b>	0.07 (-0.02; 0.17)	<b>0.09 (0.00;0.19)*</b>
Challenge	<b>0.14 (0.06;0.21)***</b>	<b>0.13 (0.05;0.20)**</b>	0.05 (-0.01; 0.10)	0.05 (-0.01; 0.10)	<b>0.09 (0.01;0.16)*</b>	0.06 (-0.01; 0.14)
Covariates						
Age		-0.01 (-0.03; 0.02)		-0.01 (-0.02; 0.00)		<b>-0.01 (-0.03;-0.00)*</b>
Gender:						
Female		0.20 (-0.11; 0.51)		0.12 (-0.03; 0.27)		<b>0.31 (0.13;0.49)***</b>
Country:						
Belgium		<b>-0.44 (-0.76;-0.13)**</b>		0.04 (-0.11; 0.20)		<b>-0.23 (-0.41;-0.05)*</b>
Job category: <sup>a</sup>						
Researchers without a PhD		-0.36 (-0.88; 0.15)		-0.03 (-0.29; 0.23)		-0.24 (-0.53; 0.06)
Researchers with a PhD		-0.06 (-0.50; 0.38)		-0.08 (-0.30; 0.14)		-0.22 (-0.48; 0.03)
Work location: <sup>b</sup>						
At home		-0.07 (-0.20; 0.06)		-0.07 (-0.16; 0.02)		<b>-0.18 (-0.31;-0.06)**</b>

Note: The bold values are significant results.

Abbreviations: CI, confidence interval; N, 55; number of item measurements, 3665.

<sup>a</sup>ref. Admin and technical staff.

<sup>b</sup>ref. Non-home: Participants did not work exclusively at home on the questioned day. They either worked partially at home, worked at their office, or worked at a third location.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



( $\beta = 0.09, p < 0.05$ ). Model C2 further shows a negative association between age and seeking social support ( $\beta = -0.01, p < 0.05$ ), suggesting that asking for support is a coping style that was less frequently used with increasing age. For gender, a positive association with seeking social support was found ( $\beta = 0.31, p < 0.001$ ), showing that women chose social support more often to cope with their experienced stressful situations compared to men. Furthermore, the country of participation had a significant effect, since Belgium reported a lower tendency in seeking social support compared to Slovenia ( $\beta = -0.23, p < 0.05$ ). The work location showed a negative association with seeking social support ( $\beta = -0.18, p < 0.01$ ), suggesting that employees working at home were seeking social support less often compared to employees who did not work exclusively at home on the questioned day. Interestingly, the job category did not have any significant association with any of the coping styles.

We tested the sensitivity of our results for a time effect on day-level over 15 days of data collection to check for an increasing or decreasing trend in coping. However, no significant effect was found.

## 4 | DISCUSSION

This is the first study—that we are aware of—which investigates the associations between day-to-day threat and challenge appraisal and the three coping strategies of day-to-day problem-focused coping, emotion-focused coping, and seeking social support among office workers in academic settings. The purpose of an indicative study described in this paper is to offer new perspectives on EMA-based research, serving as an indicator for further investigations into more extensive sample sizes and different study populations.

Our findings confirm previous results on the associations between stress appraisal and coping with stress (Anshel et al., 2001; Durak, 2007). When the participants were confronted with day-to-day stress they were more likely to use problem-focused coping if they appraised the stressful situation as a challenge, in line with a previous EMA study on controllability of a stressful situation and problem-focused coping (Socastro et al., 2022) and the challenge-hindrance stressor framework (Cavanaugh et al., 2000). When they appraised the stressful situation as a threat, they were more likely to use emotion-focused coping, as suggested by the challenge-hindrance stressor framework (Cavanaugh et al., 2000). As shown in the descriptive results, problem-focused coping showed a higher mean value across participants compared to the other two coping styles. This result was confirmed by other research focusing on academics, revealing that in this occupation group mostly adaptive coping, such as cognitive coping is being adopted to respond to work stress (Darabi et al., 2017; Kersh, 2018; Mark & Smith, 2012). Furthermore, the study done by Kerr et al. (2020) indicates that if a stressful situation is appraised as less threatening but still challenging, this could lead to increased work engagement, being an adaptive way of coping. Such adaptive coping is associated with successful coping and physiological as well as psychological health and well-being (Du Plessis, 2020).

The results further suggest an association between challenge appraisal and seeking social support. When adjusting for covariates, challenge appraisal was no longer associated with seeking social support, but threat appraisal became a significant predictor. Both threat and challenge appraisal are positively associated with seeking social support as shown in models C1 and C2. This is different from models A and B, where one appraisal is clearly more associated with a certain coping style than the other. The distinction between threat and challenge is not as important for seeking social support as it is for other coping styles and it seems to be a coping style chosen regardless of the two appraisal predictors. The coefficients themselves are not changing much when adding the covariates, only the statistical significance is altered. Based on these results, seeking social support as a coping style to handle stress in academia remains a topic requiring further research. Our research suggests that seeking social support should be treated as a standalone coping category (Carver et al., 1989), instead of considering it as sub-categories of problem-focused and emotion-focused coping.

Additionally, age was a significant covariate suggesting that with increasing age of the office workers, the likelihood of seeking social support decreased. Previous research focusing on age and coping strategies confirmed such an influence of age on the choice of coping, showing that older workers tend to choose more passive types of coping (Trouillet et al., 2011), in line with the trend found in our results.

This study showed that female office workers in academic settings were more likely to seek social support after a stressful situation compared to men. This result is in line with previous research showing clear gender differences in seeking social support when coping with work stress (Christie & Shultz, 1998; Torkelson & Muhonen, 2004).

The question about work location was included due to the Covid-19 pandemic, which was not part of the initial EMA protocol. The descriptive results showed that the participants worked more often at home compared to the office or a third location. During periods of working from home, the participants reported less often that they would be reaching out to colleagues for social support as a way of coping with their stress. The consequences of working from home on workers' well-being have received increasing attention in research since the Covid-19 pandemic (Tejero et al., 2021). Based on a recent study among researchers looking into personal experiences with working from home and coping with stressful events occurring in different work locations, 70% of the participants reported thinking that in the future they would be similar or even more efficient than before if they were allowed or able to work more often from home. Additionally, 66% of the researchers stated they would find it ideal to work more often from home in the future compared to before the Covid-19 pandemic. They further indicated that at home they were better at analysing data, reading literature, or working on manuscripts. At the office, on the other hand, they reported being able to better share thoughts with colleagues or keep in touch with their research team (Aczel et al., 2021). These aspects probably fall under the coping style of seeking social support for instrumental reasons. While sharing thoughts with colleagues is perhaps primarily seen as

collaborative work, the social support aspect is most likely just as important. The results are comparable to our findings with working from home depicting a restriction on reaching out to others. This is a highly relevant finding considering that working from home is becoming an increasingly established element of organising work, especially among office workers and especially since the start of the Covid-19 pandemic. This suggests that attention has to be paid to how such working arrangements can be optimised and that coping with stress needs to be closely monitored to prevent adverse effects on workers' health and well-being (Aczel et al., 2021).

#### 4.1 | Strengths and limitations

An important strength of this study is the data collection procedure with our EMA protocol implemented in our STRAW smartphone application (Lukan et al., 2020). Through this approach, we managed to collect a large dataset of repeated measurements including 55 office workers in academia across 15 working days. This dataset enabled us to test the association between day-to-day stress appraisal and day-to-day coping in comparison to traditional occupational studies based on chronic stress. This approach is supported by previous research, showing that moods and emotions are dynamic phenomena, requiring such an EMA data collection procedure (Kuppens et al., 2012).

The ICC calculations of the three coping styles showed higher day-to-day variance explained by the within-participant level compared to the between-participants level. This underlines the need for more studies looking into the dynamic aspects of work stress, stress appraisal, and coping in office workers in academia.

Additionally, despite a demanding data collection procedure, we had a strong participant adherence with only 4.5% missing item measurements about appraisal and coping originating from the completed EMAs and no drop-outs between briefing and debriefing.

A limitation concerning the data analysis procedure needs to be raised since seeking social support was solely analysed as one dependent variable including both subscales, seeking social support for instrumental and emotional reasons. Therefore, no distinction can be made between the reasons why workers reach out to others for social support. However, this approach was chosen to limit participant burden with a restricted number of items per subscale.

Our recruitment strategy applying a convenience sampling method comes with the limitation of a non-random sample, potentially introducing selection bias. We need to specify here that we most likely included office workers with, on the one hand, an intrinsic interest in the topic of work stress and on the other hand, the capacity to participate despite the demanding data collection procedure. Additionally, including participants from two different institutions in two different countries, introduced different academic cultures and cultural differences. A possible consequence is limited external validity towards other office jobs in and outside of academia.

Moreover, coping can be considered as a repeatedly applied strategy to deal with stressors, developed based on previous

experiences. However, the distinction between such coping mechanisms and character traits on how one deals with stress, was not investigated in this study. Nevertheless, we found a strong within-participant variance in our findings, suggesting that coping is more of a fluctuating than a static experience.

Lastly, calculating the reliability of the measures used in this study proved to be unfeasible due to our triggering protocol. As is usual in EMA studies, we only used a small subset of items from the scales at each measurement point (i.e., each EMA). However, as opposed to always simply offering the same set of items, we chose two random items from a pool of all available items, which was for example, eight in the case of the problem-focused coping subscale. Consequently, problem-focused coping was measured with a variety of item combinations throughout the data collection period. Theoretically, a participant could have been asked about an item very frequently and another item (almost) never. Therefore, at each measurement point, there were missing values by design in every subscale measured. Missing values can be handled by the full information maximum likelihood approach, where the likelihood is calculated case by case, using all available data from that case (Rosseel, 2012). However, this still assumes coverage larger than 0% and this assumption was violated in our study. Since the number of observations per participant was comparable to the item pool size, it often happened that two items never occurred at the same measurement time point. This means that it was impossible to calculate correlations between such pairs of items. While we consider our protocol design to be an advantage of our study, since, anecdotally, it reduced automaticity in answering the questionnaires, it seems that calculating reliability in such a design is still an open question.

## 5 | CONCLUSIONS

This study confirms the results of previous research on stress appraisal and coping. First, younger office workers and female office workers reported more often seeking social support. Second, when the participants were confronted with day-to-day stress they were more likely to use problem-focused coping if they appraised the stressful situation as a challenge. When they appraised the stressful situation as a threat, on the other hand, they were more likely to use emotion-focused coping.

While this paper confirms certain previous research, new results concerning the associations found between working from home and seeking social support should also be highlighted. Our findings show that working from home is associated with lower tendencies to seek social support. This suggests that working from home can be a restriction to reaching out to colleagues or supervisors when stressful experiences occur. This finding urges further research to include the work location as a key dimension when investigating day-to-day stress appraisal and coping among office workers. Furthermore, our results suggest an association between both threat as well as challenge appraisal and seeking social support—associations that have rarely been studied until now. This aspect requires further

investigation, especially since social support can act as a buffer between stress experiences and stress outcomes. For further research, it would be interesting to look into seeking social support for instrumental and emotional reasons separately, especially due to the increasing trend of working from home and the challenge of providing social support when required during work-related stress experiences at home.

#### AUTHOR CONTRIBUTIONS

Conceptualisation: Larissa Bolliger, Junoš Lukan, Mitja Luštrek, and Els Clays; Methodology: Stephanie Hulin, Larissa Bolliger, and Junoš Lukan; Software: Junoš Lukan and Mitja Luštrek; Investigation/Validation/Formal analysis: Stephanie Hulin, Larissa Bolliger, Junoš Lukan, Anneleen Caluwaerts, and Rosalie De Neve; Resources: Larissa Bolliger, Junoš Lukan, Mitja Luštrek, and Els Clays; Data curation: Stephanie Hulin, Larissa Bolliger, Junoš Lukan, Anneleen Caluwaerts, and Rosalie De Neve; Writing—original draft: Stephanie Hulin and Larissa Bolliger; Writing—review and editing: Stephanie Hulin, Larissa Bolliger, Junoš Lukan, Anneleen Caluwaerts, Rosalie De Neve, Mitja Luštrek, Dirk De Bacquer, and Els Clays; Visualisation: Stephanie Hulin, Larissa Bolliger, Anneleen Caluwaerts, and Rosalie De Neve; Supervision: Mitja Luštrek, Dirk De Bacquer, and Els Clays; Project administration: Larissa Bolliger and Junoš Lukan; Funding acquisition: Mitja Luštrek, Dirk De Bacquer, and Els Clays.

#### ACKNOWLEDGEMENTS

We are very appreciative of all our participants—without them, this paper would not have been possible. This work was supported by the Research Foundation-Flanders, Belgium (FWO) under Grant (Project No. G.0318.18N) and the Slovenian Research Agency (ARRS) under Grant (Project Ref. N2-0081). The funding agencies had no involvement in the study design, the data collection, the analysis, the interpretation of the data, the writing of the paper, or the decision to submit the paper for publication.

#### CONFLICT OF INTEREST STATEMENT

The authors of this paper declare no conflicts of interest.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

#### ETHICAL STATEMENT

Ethical clearance for the STRAW project was received from the Commission of Medical Ethics of the Ghent University Hospital, Belgium (No. EC/2019/1091) and the Ethics Committee of the Faculty of Arts at the University of Ljubljana, Slovenia (No. 168–2019). All participants signed a written informed consent before their participation. After participating, the Belgian participants received a 30 Euro voucher as a reward for their efforts. This was not possible for the Slovenian participants, as the partner institute in Slovenia is a

public institution, which makes providing incentives to participants legally difficult. Both, the Belgian and Slovenian participants received a personalised feedback report based on their results (Bolliger et al., 2020).

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**How to cite this article:** Hulin, S., Bolliger, L., Lukan, J., Caluwaerts, A., De Neve, R., Luštrek, M., De Bacquer, D., & Clays, E. (2023). How does day-to-day stress appraisal relate to coping among office workers in academia? An ecological momentary assessment study. *Stress and Health*, 1–12. <https://doi.org/10.1002/smi.3315>