

The order in which you cope matters:

An examination of the moderating role of coping sequence on the impact of stressor type on
affect

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ABSTRACT

To date, few studies have sought to investigate whether the sequence in which individuals engage in coping strategies could impact the effectiveness of those strategies. The present study utilizes an EMA data collection approach to obtain a sample of $N = 93$ student participants to investigate this potential impact. I analyzed the data with a type of multilevel structural equation model (MSEM) called a cross-lagged panel model (CLPM), where the individual served as the higher level and surveys collected at various time points (three per day for five consecutive days) served as the lower level nested within those individuals. Autoregressive, cross-lagged, and moderation paths were tested to see which constructs at time point T-1 were significantly related to positive affect and negative affect at time point T. Findings indicated more significant relationships for positive affect at time point T than negative affect at time point T. Among these were moderation effects of coping strategy on the relationship between the presence of an interpersonal stressor and positive affect, such that emotion-focused coping buffers that effect and problem-focused coping amplifies it.

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GENERAL AUDIENCE ABSTRACT

The history of stress and coping research lends itself well to the consideration of coping with stress as a dynamic process that has effects at later times. Different coping strategies (problem-focused, emotion-focused, and avoidant) may be differentially effective for coping with different types of stressors. This study consists of measuring stressor type, coping strategy, positive affect, and negative affect at 15 different time points, specifically to track the impact of the presence of a stressor, the use of certain coping strategies, and positive and negative affect at any given time point on positive and negative affect at a subsequent time point. Specifically, I hypothesize that stressors decrease positive affect and increase negative affect, and that coping strategies can either buffer or intensify these effects. Support is found for the idea that emotion-focused coping buffers an interpersonal stressor's tendency to decrease positive affect. Support is also found for the idea that problem-focused coping intensifies this same tendency.

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Review of Relevant Literature

Stress

One of the principal areas of research in industrial-organizational psychology is concerned with how best to promote the welfare of any organization's greatest asset—its employees. In enterprises across the world, organizational leadership has become increasingly interested in and concerned with maximizing employee well-being (Wright & Cropanzano, 2000). One of the most frequently studied types of employee well-being is stress. Stress research in an organizational context has spanned decades and has concerned itself with areas of emphasis ranging from sources of stress to common means of dealing with and/or resolving that stress to the outcomes related to failure to do so (Rauch et al., 2018). Work has been commonly cited as one of the greatest sources of stress for adults in the United States; 61% of adults surveyed by the American Psychological Association stated that their work was a major source of stress (Winerman, 2017). Furthermore, stress research is anticipated to see continued growth and emphasis in the coming years. Contemporary challenges like the COVID-19 pandemic and resulting initiatives concerned with remote work and vaccination requirements have served as interesting applications for models of stress (Rudolph et al., 2021).

Several models of stress that have been developed and studied within organizational psychological research in previous decades have become building blocks from which more contemporary perspectives on stress research have evolved. Among these are the demands-control model of stress (Karasek, 1979), the conservation of resources (COR) theory (Hobfoll, 1989), and the challenge-hindrance framework (LePine et al., 2005). The present study focuses on the transactional theory of stress, which serves as the predecessor of the challenge-hindrance

framework and offers a broader perspective on the role of appraisal in stress, as well as providing a language for conceptualizing the role of stressor sequence (Lazarus & Folkman, 1984).

One of the foundational principles of the transactional theory of stress is that individuals exercise two forms of appraisals for stressors—primary and secondary. Primary appraisals represent the individual-level classification of a stimulus as either a stressor or a non-stressor. For instance, imagine that a person is dealing with a time constraint for a project at work. This time constraint may be considered by some to be stressful. Others may not find it stressful. That time constraint's status as a stressor is dependent on individual-level factors such as the importance of the project, the consequences of failing to complete the project in time, and the level of responsibility that person has over the project. As a result of these and other factors, some time constraints will be primarily appraised as a stressor and others may not be. Furthermore, the same project time constraint may be primarily appraised as a stressor by one individual, but as a non-stressor by another individual.

In the event that any given stimulus is appraised as a stressor, the transactional theory of stress purports that a secondary appraisal then occurs. Secondary appraisal represents the ways in which a person chooses to confront a stressor once it is perceived as such; this is also referred to as coping. A final important consideration of the transactional theory of stress in the context of the present study is that the primary and secondary appraisals occur simultaneously, such that the latter can inform the former. Put otherwise, one's perceived ability to cope with a given stimulus can impact the extent to which that stimulus is perceived to be a stressor.

Types of Stressors and Their Impact

Stressors present in a plethora of different forms with varying degrees of severity. From an appraisal perspective, what one person may perceive as a stressor, another may be unbothered by. There are many different approaches to the development of stressor types. One way to categorize stressors is by their temporal status. Albrecht (1979), for instance, distinguished between anticipatory stress and situational stress, with the former accruing in preparation for stressors that have yet to occur and the latter occurring in-the-moment. Another way to potentially segment stressors is by the area of life in which they present. Stressors could be related to one's health, finances, job, relationships, or any other number of things (Concordia University, 2022). In the context of research in organizational psychology, segmenting stressors by different facets of the job and/or the organization is the most common approach. One means of work stressor classification arose from Cooper and Marshall's model of work-related stress (1976). This model defines five broad categories of work-related stressors, including: 1) stressors intrinsic to the job, 2) stressors related to one's role in the organization, 3) stressors related to the organizational climate or structure, 4) stressors related to career development, and 5) stressors related to relationships within the workplace. These categories of stressors have been used both in their original and in adapted forms to conceptualize stressors in the workplace in a large swathe of occupational stress research (Johnson et al., 2005; Motowidlo et al., 1986; Schuler, 1980).

As such, many of the most commonly conceptualized work stressors in contemporary models track well with these five broad categories. The American Psychological Association, for instance, has cited several common sources of work stress (2014). Among these are lack of social support, conflicts with peers and/or supervisors, excessive workloads, work that isn't

challenging or engaging, conflicting demands, and unclear performance expectations. These sources of work-related stress track with broader categories of stress that condense the five categories outlined by Cooper and Marshall. These categories serve as the guidelines for stressor type for the purposes of the current project and include: 1) interpersonal stressors and 2) workload-related stressors.

Interpersonal stressors are those resulting from interactions between people that can involve quarrels, arguments, negative attitudes or behaviors, an uncomfortable atmosphere, and concern about damaging one's relationship with others (Kato, 2013). Interpersonal stressors can be impactful to one's personal life as well as their professional life, and the implications of those stressors can play out over the course of several days or even weeks. Additionally, there is some evidence that suggests that the unique features of interpersonal stressors may warrant unconventional coping approaches for individuals facing such stressors (Kato, 2014).

Workload-related stressors are those resulting from the match or lack thereof between the quantifiable demands incurred through one's work and one's expectations regarding those demands (Wu et al., 2013). An individual whose actual number of work-related demands exceed the number of demands that the individual would anticipate being able to properly deal with, for instance, would likely feel as though they do not have the bandwidth to meet all of their expectations. Conversely, individuals who anticipate having far more demands than they're dealing with in actuality may feel as though their work is unfulfilling or that they are underachieving. For both extremes, this mismatch would likely be perceived and experienced as a stressor. Workload-related stressors have been examined among a variety of organizational populations but has historically been most prominently studied among teachers (Smith & Bourke, 1992; Usoro & Etuk, 2016).

Historical Origins of Coping Research

Naturally, researchers interested in the occurrence and experience of stress are often also interested in evaluating the ways in which people cope with that stress. Coping is commonly conceptualized as any means of reducing unpleasant emotions, including stress (Scheier & Carver, 1985). One of the longest-standing coping frameworks is that which was utilized by Charles Carver and Michael Scheier (1988) in their explorations into the process and measurement of coping. Specifically, this framework originates from a model of behavioral self-regulation and from the transactional theory of stress (Lazarus & Folkman, 1984). The former is built out from the notion that behavioral goals become salient in a given situation when information specifying a particular behavior is encoded in memory along with interpretive schemas. In describing this model and its utility, Scheier and Carver draw specific attention to coping ability and approaches to coping as functions of an optimism-pessimism dimension (1988). Specifically, they posit that optimists engage in more involved coping strategies, whereas pessimists tend to be more strongly associated with effort withdrawal.

To study the process of coping, Folkman & Lazarus (1985) developed the Ways of Coping questionnaire. One of the foundational contributions of the Ways of Coping is the distinction between two types of strategies—problem-focused coping and emotion-focused coping. The former is aimed at attacking the source of the stress by intervening to alter or address the problem. The latter intends to reduce or manage the emotional distress that is caused by the stressor in question. Folkman and Lazarus argued that most stressors produce both types of coping, but that problem-focused coping took was more likely to occur when the individual in question thought that the stressor was actionable. Emotion-focused coping, on the other hand,

was more prominent when the individual thought that the stressor was one that had to be endured.

This step to distinguish between problem-focused and emotion-focused coping strategies is a theoretically important one, but subsequent studies have argued that it is overly simplistic. In the years that followed Folkman and Lazarus's development of the Ways of Coping scale, several researchers found that responses to that scale tend to form several factors rather than only those two (e.g., Aldwin & Revenson, 1987; Folkman et al., 1986; Scheier et al., 1986). Generally speaking, these studies view problem-focused coping as a single factor and all other factors are conceptualized as variations of emotion-focused coping, though the divergence of these factors can be quite sharp. Carver and colleagues argued that both problem-focused and emotion-focused coping deserved closer examination, as responses classified within the same group could operationally be very different from each other (Carver et al., 1989). For instance, responses such as denial, positive reinterpretation of events, and some forms of social support seeking are all classified as emotion-focused coping, though they can be quite different both in objective appearance and in the potential implications for success in coping. In that vein of interest, they developed a multidimensional coping inventory, broadly referred to as the COPE Inventory. The COPE Inventory contains thirteen scales that aim to measure aspects of problem-focused coping, emotion-focused coping, and avoidant coping. Avoidant coping strategies are those that neither address the problem nor the resulting emotions (Cronkite & Moos, 1995). Avoidant coping strategies are generally seen as less useful in the long-term because of their tendency to avoid addressing either the problem or the emotions that result from that problem (Roth & Cohen, 1986).

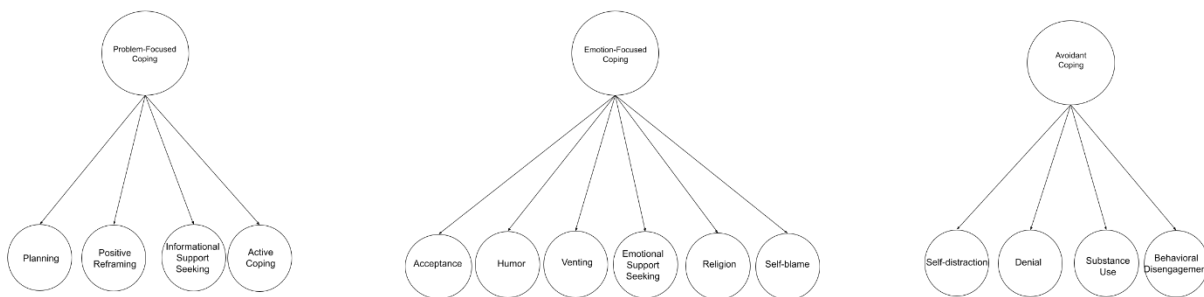
The original battery of 60 items was subsequently trimmed to 28 in an edition referred to as the Brief COPE (Carver, 1997). The Brief COPE was initially validated on a sample of 168 participants within a community that had been impacted by a hurricane (Carver, 1997). Two primary means of delineating the factors in this instrument have appeared in the literature. Eisenberg and colleagues indicated two major factors (avoidant and approach coping) in a study with heart failure patients (2012). Research by Dias and colleagues, however, reinforced the three-factor model, dividing the scale into problem-focused coping, emotion-focused coping, and avoidant coping as was the case with the COPE Inventory (2012). The three-factor model is quite commonly used for scoring purposes in contemporary coping research (Hegarty & Buchanan, 2021; Poulus et al., 2020). The Brief COPE consists of 14 subscales of two items each that measure aspects of problem-focused, emotion-focused, and avoidant coping. The extent to which each subscale aligns with a particular type of coping, however, is subject for debate. Valerie Rice and colleagues subsequent studies, specifically, have made the case for positive reframing to be considered emotion-focused coping and for venting and self-blame to be considered avoidant or dysfunctional strategies. The vast majority of researchers utilizing the three-factor approach for the Brief COPE, however, classify positive reframing as a problem-focused strategy and classify self-blame and venting as emotion-focused strategies (Figure 1). From this commonly used framework, then, facets of problem-focused coping include active coping, informational support seeking, positive reframing, and planning. Facets of emotion-focused coping include emotional support seeking, venting, humor, acceptance, religion, and self-blame. Facets of avoidant coping include self-distraction, denial, substance use, and behavioral disengagement. Carver recommends that any and all of the 14 subscales can be selected for use and implemented

independently, as they each reflect a different aspect of coping styles (Carver, 2022). As such, there is no “overall” score of coping that may be generated from the Brief COPE.

Figure 1.

Three Factor Model of Coping with Facets

The Three-Factor Model of Coping



Contemporary Coping Considerations

Considering a robust amount of the coping literature has evolved from transactional theory, many contemporary coping models have sought to emphasize the theoretical perspective that coping is a dynamic process—one that changes according to the context of the situation and the individual’s perception of their own ability to cope with the stressor in question. This is especially the case because of the presumption that successful coping should involve the ability to alter strategies in a way that can maximize positive outcomes (Lazarus & Folkman, 1987). As such, the idea of coping flexibility has gained more and more momentum in the last decade. Coping flexibility refers to an individual’s ability to modify their coping behavior according to the nature of each stressful situation (Cheng et al., 2014). Coping flexibility consists both of

evaluation coping and adaptive coping, with the former referring to one's ability to recognize that a coping strategy is ineffective and discontinue its use and the latter referring to one's ability to implement an alternative coping strategy that is informed by the rationale for why earlier efforts were unsuccessful (Kato, 2012).

It is important to note that coping flexibility is not synonymous with coping dynamism, nor is it synonymous with coping sequencing. Coping flexibility is ability-based in the sense that individuals are engaging in coping flexibility essentially whenever they are coping with a stressor – whether the outcome of that flexibility is to change strategies or to persist with the current strategy. Coping sequence relates more to the outcomes associated with coping flexibility. For example, coping flexibility could lead someone to engage in problem-focused coping, then emotion-focused coping, then avoidant coping. That coping strategy order is the coping sequence. Finally, both coping flexibility and resulting coping sequences lend themselves well to examining coping dynamically – studying it as a process with downstream effects rather than isolating the impact of coping strategies on the time at which they were reported.

Normative Sequencing of Coping Methods

Though the coping literature has advanced to incorporate the dynamicity of coping into study designs, there are still limitations. Namely, any investigation of the use of coping strategies is typically limited to means-based analyses that examine which strategies are used and how frequently they are used (Finset & Andersson, 2000; Miller Smedema et al., 2010; Riolli & Savicki, 2010). Such an approach fails to distinguish between individuals who use a large variety

of coping strategies infrequently and those who utilize a limited number of strategies very frequently (Heffer & Willoughby, 2017).

The tradition of means-based analyses has largely overlooked the consideration that the sequencing with which an individual engages in their coping strategies could be impactful to successful coping. For instance, imagine that an individual encounters a stressor and immediately implements a coping strategy to respond. If the individual then switches to a different coping strategy, the secondary strategy could potentially be made more or less effective by the initial coping strategy. Alternatively, an individual could consistently switch back and forth between two or more strategies. When simply examining strategy type and duration, however, this is indistinguishable from an individual who utilizes one strategy for an extended period of time before switching to a second strategy that they utilize for an equal duration. This evolution of the approach to coping could be premeditated in the sense that the individual determines what the second or third implemented coping strategy will be in the event that initial efforts are unsuccessful. It could also be more organic in the sense that the individual waits to see the way(s) in which the initially chosen coping strategy is effective or ineffective before deciding which secondary strategy to pursue. In either case, there are internal mechanisms that underpin the individual's approach to coping that could be differentially impactful to any outcome of interest used to evaluate coping strategy effectiveness.

There have been isolated instances of studies that have sought to expand on the coping literature with an eye towards the sequencing of coping strategies—Holmberg et al. (2011) explored whether stressor severity or attachment styles impacted coping sequences. Additionally, Taylor Heffer and Teena Willoughby (2017) sought to incorporate several of the aforementioned modern coping considerations. They implemented a longitudinal design that sought to examine

the bidirectionality of coping in the context of positive and negative adjustment, while conceptually operationalizing stress as a moderator. Additionally, they sought to compare the traditionally used means-based approach with a count-based approach. Through their analyses, they found that the count-based approach offered findings above and beyond those offered by the means-based approach, specifically in that the use of a greater number of positive coping strategies is more adaptive. Specifically, the use of a larger number of positive coping strategies promoted positive adjustment and decreased negative adjustment.

Notably, the longitudinal design of the aforementioned study consisted of measurements at two time points that were separated by an entire year (Heffer & Willoughby, 2017). To obtain a more accurate sense of the trajectory of coping for the same stressors, it may be useful to constrain the time frame of data collection to a shorter period of time. A time period of one week, for instance, with multiple points of measurement throughout the day would allow for the tracking of how approaches to coping for a given stressor change within a single day as well as how approaches for more long-term stressors are adapted across multiple days. There would even be the potential to track coping approaches for a given stressor from the outset of the stressor all the way to its resolution. To date, no study has sought to test the ways in which the sequence of selected coping strategies could potentially impact outcomes of interest relevant to coping success, such as positive and/or negative affect. Doing so would add a second temporal layer to the investigation of coping that could contribute to the dynamism with which this process can be investigated. Additionally, no study at the time of writing has examined how the impact of different types of stressors could be moderated by various coping strategy sequences. As a result, this potential intersection of stressor type, selected coping strategies, and the

previously discussed temporal elements could provide a more holistic, nuanced examination of coping as it occurs in real time.

The examination of coping sequences lends itself well to addressing the process of coping as a dynamic one rather than isolating it as a single episodic instance that is unchanged or unaffected by other instances of coping. The existence of different coping sequences is evident that, through the mechanisms described earlier, individuals are able to evaluate coping effectiveness in the moment and adjust when they feel as though it is appropriate to do so. This lends further support to the notion that the lessons learned and insights gained from coping strategies that are implemented earlier may contribute to strategies implemented later. As such, some contextual information may provide a clearer image of how and why an individual's approach to coping with a given stressor is more or less effective.

If a particular sequence of coping makes an individual more likely to be successful in their coping efforts, then the availability of a variety of potential coping strategies would logically serve as an important precursor (Bonanno & Burton, 2013). At the same time, there are some strategies that may be universally detrimental no matter how frequently or infrequently an individual engages in them (Kato, 2012). For example, strategies like self-blame and substance abuse would not be likely to increase the favorability of the outcome regardless of the context of the coping. As such, any consideration of coping sequences should perhaps include an emphasis on the ability and the tendency to select coping strategies that at least have the potential to be positive in some scenarios.

Current Project: Pairing Stressor Type with Coping Strategy

One of the primary contributions of the present study is to examine whether certain organizationally relevant stressors are more appropriately dealt with by implementing certain coping strategies over other options. When considering coping strategy effectiveness, researchers often turn to an analysis of positive and negative affect. An increase in the former and a decrease in the latter would suggest that a coping strategy is effective, while the opposite would indicate that a coping strategy is ineffective. Positive and negative affect are among the outcome variables most widely studied for their relationship with coping strategy effectiveness (Ben-Zur, 2009; Folkman & Moskowitz, 2000; Yamasaki et al., 2006). There is ample evidence to suggest that the match between a given stressor and a given coping strategy may be a product of the nature of the stressor. Problem-focused coping strategies, for instance, are generally considered ineffective when the stressor in question is outside of the control of the individual (Lauer, 2008). Because problem-focused strategies are naturally aimed at intervening with the stressor, they will be ineffective when the stressor is one that the individual cannot intervene with. In fact, such attempts may even be detrimental in the sense that they result in an increased sense of helplessness, which could decrease positive affect and increase negative affect. The COVID-19 pandemic is a great example of this. As COVID is a very complex stressor, there are certain components that can be addressed by problem-focused coping (such as getting vaccinated). That being said, no individual problem-focused strategy can effectively eliminate the stressor as a whole. When the stressor is changeable or able to be impacted, on the other hand, emotion-focused coping would be the less effective option. Someone who is chronically late to work-related meetings for avoidable reasons would probably benefit more from a problem-focused approach like prioritizing time management than they would from an emotion-focused approach

like seeking emotional support. It may be beneficial to extend this line of thinking to stressor types that are commonly experienced within the workplace to conceptualize which coping strategies would be most and least effective.

For interpersonal stressors which, again, stem from a conflict between two or more people, it is useful to think of control as well as other elements unique to interpersonal stressors. Because these types of stressors often manifest in the workplace as a conflict between an individual and one or more peers or supervisors, the underpinnings of these stressors are often highly emotional and personal in nature. Additionally, these stressors may be persistent in the sense that the people or situations that induce them may be unavoidable in many circumstances. For instance, one may constantly need to collaborate with or simply be close in proximity to a coworker with whom they are quarreling. Even though individuals can commonly control the stressor in the sense that they can directly impact it, many interpersonal stressors stem from individual differences in opinion or values. There is, one could argue, a “human” element that could perhaps make the pragmatism of problem-focused strategies too cold or distant, rendering such strategies ineffective. Therefore, the implementation of emotion-focused coping strategies could be more direct in addressing the problem that is underlying the conflict or quarrel in question.

Workload-related stressors, to reiterate, are those resulting from a mismatch between the workload incurred by an employee and the expectations that they have for their workload. These stressors may occur when the individual’s demands exceed their capacity to address those demands, in which case they may feel overworked. They could also occur when the individual’s expectations for demands exceed their actual demands, in which case they may feel underworked or unfulfilled. Workload-related stressors also possess unique elements in that there are both

emotional and practical roots in many cases. In consideration of the former, many workload-related stressors originate with the relationship between employee and supervisor (Wu, Hu, & Yang, 2013). As such, the initial reaction from many employees dealing with these stressors may be a sense of injustice or inequity. Subsequently, though, a more pragmatic approach involving prioritization and/or scheduling could be beneficial for coping with these stressors (Parker et al., 2013). The element of control tracks with this dynamism in the case of many workload-related stressors—individuals may not have control over whether they are overworked or underworked, but many means of responding or adjusting to these stressors are very based in individual-level control. Even still, the initial reaction of individuals dealing with workload-related stressors is likely to be a feeling of helplessness. As such, coping sequences that primarily incorporate emotion-focused strategies are most likely to be effective. It would be interesting, however, to see how an even or fairly even allocation of resources to both problem-focused strategies and emotion-focused strategies would impact coping effectiveness. Questions such as the ordering of these strategies, the distance between time points at which these strategies are implemented, and how early these strategies need to be implemented for persistent or long-term stressors could all provide interesting insights. The protocol of the present study allows for investigating these and more questions, though they aren't necessarily explicitly addressed in the hypotheses.

Stemming from the intention of this study is an opportunity to understand the nature of the stressors that are experienced and reported by the participants in question. Any potential relationships found between the stressors at time point T-1 and positive affect or negative affect at time point T would be more insightful if the nature of the stressors themselves is understood to some degree beyond a simple classification. Certain contextual details such as the specific source of interpersonal stress, the persistence or temporal elements related to workload stress, or the

presence of consistent stressor themes outside of these two classifications would allow for a more holistic evaluation of those relationships. This would not only facilitate better understanding of the results of the present study, but would also potentially help direct stressor-level considerations for the design of future studies.

Ecological Momentary Assessment

In recent decades, there has been a movement in the field of psychology as a whole to integrate real-time approaches to data collection into studies concerned with a variety of psychological phenomena. These real-time approaches often consist of collecting data at multiple time points within a day and across larger periods of time, often through the use of electronic or digital devices (Trull & Ebner-Priemer, 2014). Real-time approaches to data collection also offer upside to more traditional approaches in that they allow for the exploration of highly complex research questions and hypotheses (Doherty et al., 2020). Specifically, researchers are able to move beyond the “what” of the constructs in question and gain deeper insights into the “when,” “why,” and “how” of the phenomena’s occurrence. This is primarily thanks to the provision of information by participants as they’re experiencing the phenomenon of interest or in the immediate aftermath of that experience. As such, these methods are able to offer a proclivity towards data that can be expressed to the highest degree of clarity. Conversely, questionnaires that ask participants about the experience of phenomena weeks or even months after it has been experienced threatens the clarity of the data on which the participants are reporting. For instance, the passage of time could encourage participants to adopt a different outlook than what they were

initially, reactively experiencing. These participants could also simply forget how they felt, what they thought, how they behaved in the moment, etc. (Moskowitz & Young, 2006).

Included among these real-time approaches to data collection is Ecological Momentary Assessment (EMA). EMA, specifically, is a real-time approach to data collection that was disciplinarily borne of both the clinical and health psychology traditions. In serving its original purpose, EMA allowed clinicians and patients alike to be aware of the frequency of occurrence of a specific set of behaviors that tended to be addictive or dysfunctional in nature (Stone & Shiffman, 1994). Methodologically, EMA emerged from the traditions of diary studies (Stone et al., 2003), behavioral observation (Barker, 1978), self-monitoring (Warnick et al., 2020), and time budget studies (Szalai, 1966). The broader idea of gathering data about people's lives via some prompt was also inspired by Experiential Sampling Methods (ESM) (Csikszentmihalyi & Larson, 1987).

The intent of EMA tends to be characterized by four discrete features: (1) the collection of data in real-world environments, (2) a focus on the current or very recent states or behaviors of individuals, (3) assessments that could be event-based, time-based, or randomly prompted, and (4) the completion of multiple assessments over time (Stone & Shiffman, 1994). Crucially, researchers incorporating EMA into their protocol tend to be concerned with the momentariness of phenomena of interest and pay particular attention to the ways in which behaviors dynamically unfold in the natural environment of participants (Ram et al., 2017). EMA also allows for the examination of how the experience of a given psychological phenomenon (approaches to coping) is impacted by an event of interest (encountering a stressor) (Schwartz & Stone, 1998). Furthermore, the measurement of these phenomena across broader swathes of time allow for an examination of potential prolonged effects.

Hypotheses and Research Question

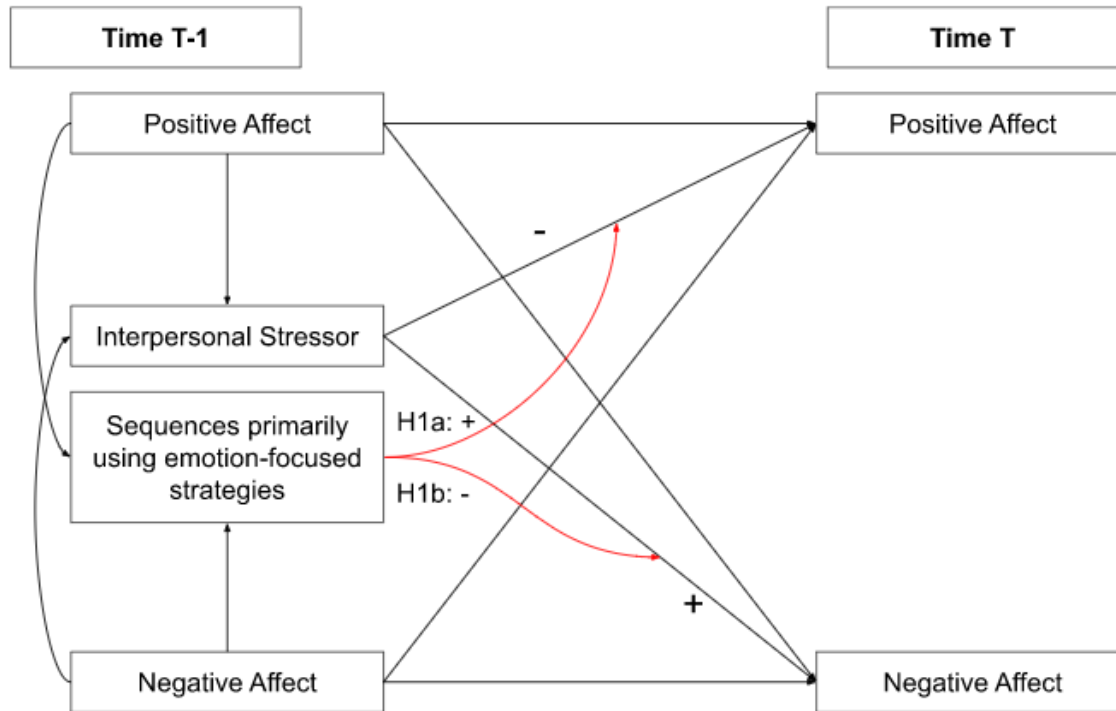
The purpose of the present study is to provide greater insight into the sequencing of coping strategies—namely, to test whether coping strategy sequences moderate the impact of stressors on positive and negative affect. Specifically, this study is interested in testing which types of coping sequences are effective for specific types of stressors and which ones are not. As such, the hypotheses for the present study are segmented on the basis of stressor type. It is also worth noting that the design of the present study permits for the investigation of highly complex sequences.

Interpersonal stressors are typically highly emotional in nature. Furthermore, the human element means that there is at least some aspect of the resolution of the stressor that the individual inherently has no control over. As such, sequences that primarily incorporate emotion-focused strategies, which are commonly useful when there is a low degree of control, may lead to a quicker resolution of the stressor and dampen the impact of that stressor on the outcomes of interest (positive and negative affect). Conversely, sequences that primarily incorporate problem-focused strategies, commonly useful when there is a high degree of control, may prolong the time spent dealing with the stressor and even lead to further negative outcomes, therefore intensifying the impact of that stressor on positive and negative affect.

Therefore, for interpersonal stressors, it is anticipated that:

Hypothesis 1a: Coping sequences that primarily incorporate emotion-focused strategies will mitigate the stressor's tendency to decrease positive affect

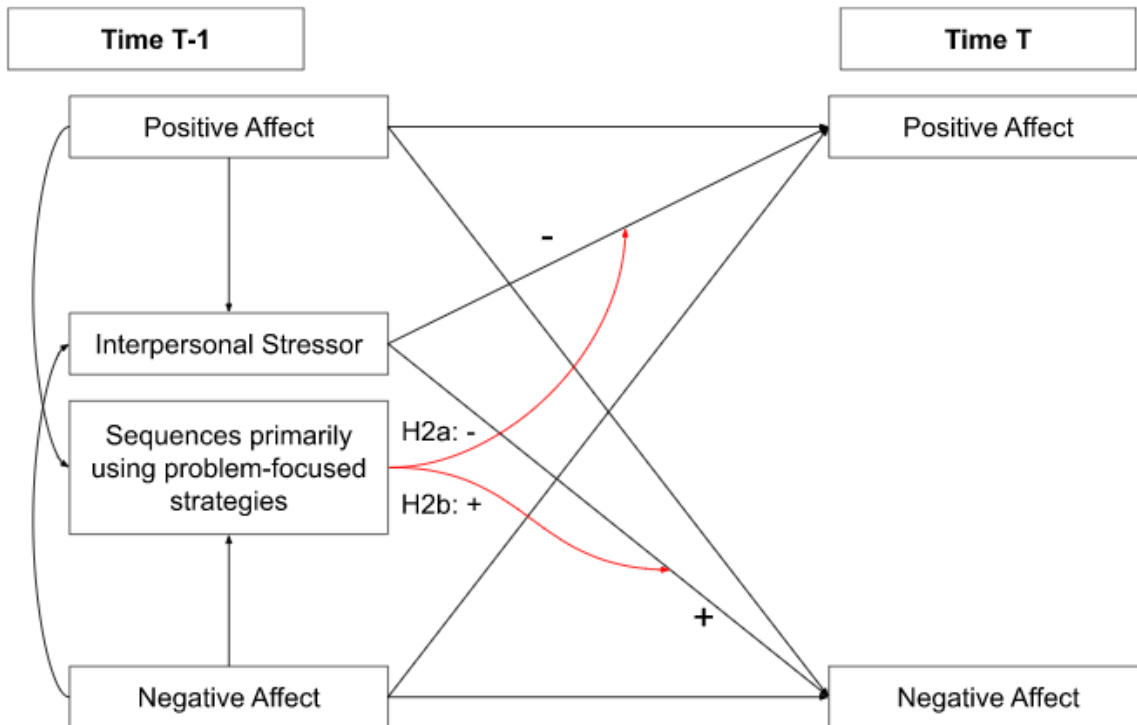
Hypothesis 1b: Coping sequences that primarily incorporate emotion-focused strategies will mitigate the stressor's tendency to increase negative affect



And that:

Hypothesis 2a: Coping sequences that primarily incorporate problem-focused strategies will intensify the stressor's tendency to decrease positive affect

Hypothesis 2b: Coping sequences that primarily incorporate problem-focused strategies will intensify the stressor's tendency to increase negative affect

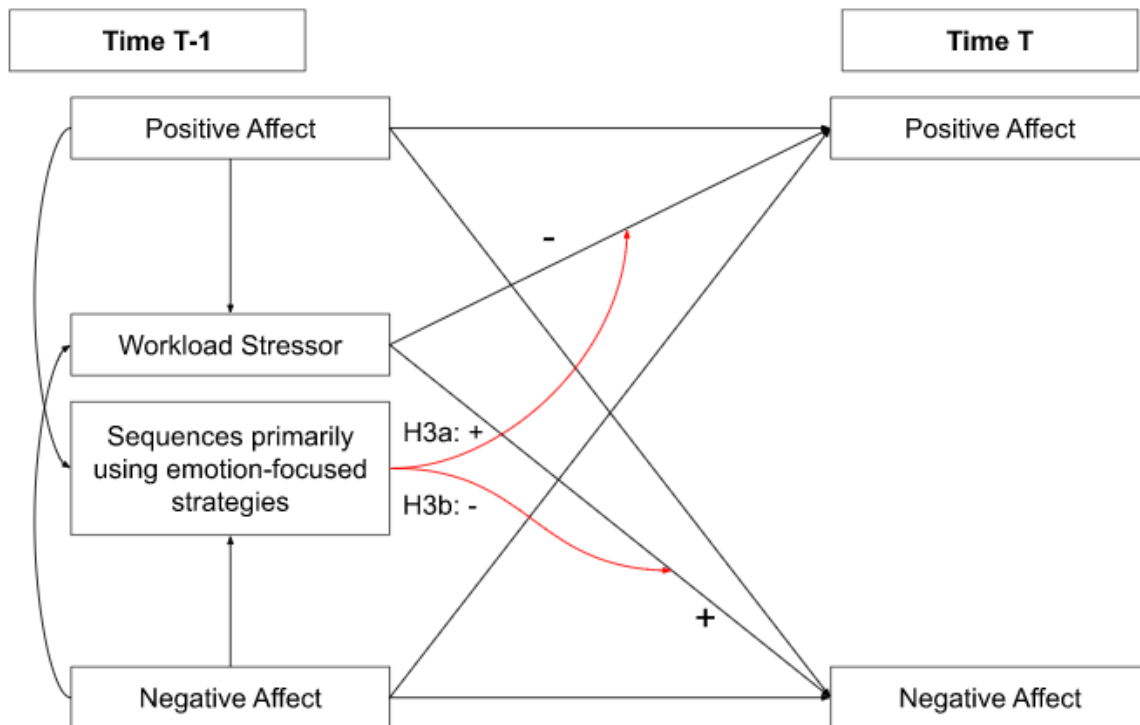


Workload-related stressors often arise when the individual has more work than bandwidth to do work. These stressors can also present when the individual has too little work and feels undervalued or unfulfilled. Again, though, the amount of work assigned to the individual is an element outside of their control. Therefore, sequences that primarily incorporate emotion-focused strategies may allow the individual to process all feelings related to the stressor and feel seen, heard, or otherwise supported. This may dampen the impact of that stressor on the outcomes of interest (positive and negative affect). Sequences that primarily incorporate avoidant strategies, on the other hand, fail to address either the stressor or the emotions that arise from the experience of that stressor. While that is generally considered harmful regardless of the situation, it may be especially harmful if the stressor in question is expected to only intensify as time passes, as is often the case with stressors related to workload.

Therefore, for workload-related stressors, it is anticipated that:

Hypothesis 3a: Coping sequences that primarily incorporate emotion-focused strategies will mitigate the stressor's tendency to decrease positive affect

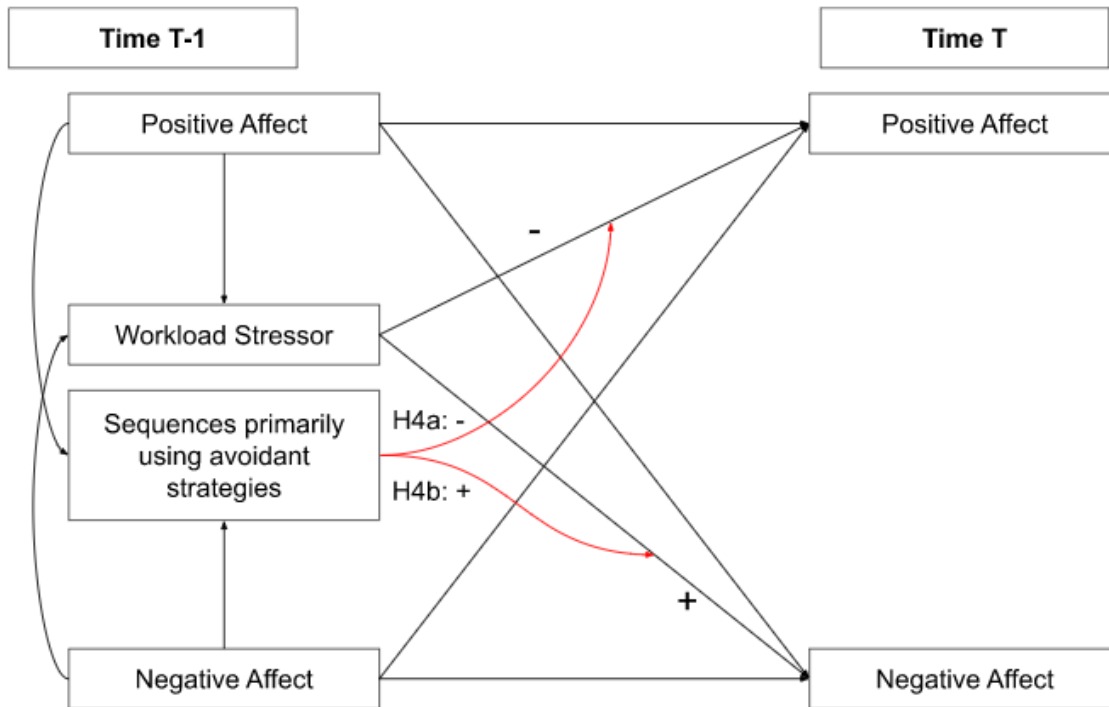
Hypothesis 3b: Coping sequences that primarily incorporate emotion-focused strategies will mitigate the stressor's tendency to increase negative affect



And that:

Hypothesis 4a: Coping sequences that primarily incorporate avoidant coping strategies will intensify the stressor's tendency to decrease positive affect

Hypothesis 4b: Coping sequences that primarily incorporate avoidant coping strategies will intensify the stressor's tendency to increase negative affect



Additionally, I've implemented a research question guiding an exploration of the nature of the stressors experienced and reported by participants. The context added by understanding themes surrounding those stressors could aid in the interpretation of the results of the present study and could also guide the direction of future research and stressor conceptualizations. These stressors were present in the dataset in the form of text-based responses; one useful means of evaluating the themes of text-based data is Latent Dirichlet Allocation (LDA) (Blei et al., 2003). LDA is a means of examining underlying topics. In this context, the LDA was concerned with discovering underlying topics within stressors reported by participants.

LDA allows you to fit a model with various numbers of topics to evaluate coherence and fit and provides an estimation of the words most likely to occur for each of the topics. In the context of LDA, coherence refers to a quantifiable assessment of the interpretability and quality of topics generated (Syed & Spruit, 2017). The principle underlying coherence is that a well-

formed topic should exhibit a high degree of semantic association among the present words and maintain contextual relevance. Therefore, coherence is a useful metric for selecting the optimal topic fit because it provides insight into what themes are present within the corpus and how well those themes can be captured by the groupings of words in the output. The LDA sorts the words by probability, providing a structured way to qualitatively interpret the meaning of those topics. The estimations of the LDA are akin to the loadings of each item above a threshold on the topic in an EFA. The end result is the parsing of reported stressors into the optimal number of topics with each topic containing a list of the words most likely to occur within that topic. This allows for the labelling of each topic to determine the crucial thematic components of the stressors reported by participants.

Formally, my research question is:

Research Question 1: What are some common themes surrounding the stressors reported by college students over the course of a week?

Method

Sample

Participants

This study used a student sample due to the nature of the study's research questions and aims, specifically for examining the moderating role of coping sequence on the impact that stressor type has on positive and negative affect. Students are subjected to a wide variety of stressors—they are tasked with balancing their education, family obligations, adjustment to new social circles, extracurriculars, and sometimes work outside of an academic context (Saleh et al., 2017). Dealing with multiple sources of stress, both in the short-term and the long-term, likely

facilitates the use of a variety of coping strategies (Maykrantz & Houghton, 2020). Being able to utilize many different coping strategies serves as an important precursor to the relationship that was being examined, as one should be able to adapt to the way that a stressor would evolve over time or at the very least choose to abandon a coping strategy if they felt as though it was not working.

Sample Size & Power Analysis

Because of the protocol of the present study, formulating a power analysis to determine the desired sample size is not nearly as straightforward a process as it is in more traditional designs. This is partially because the number of data points varied among many of the participants in the study—some participants completed a survey at each of the 15 time points, whereas the data for other participants may have been missing one or more time points. One pertinent question that often arises when implementing an EMA-style data collection approach is the relative importance of additional participants as opposed to that of additional observations. The traditional rule of thumb is that power is impacted by both, but the number of participants tends to be far more influential than the number of observations (Oleson et al., 2022; Stone & Shiffman, 1994). Also, with respect to tradition, topically- and methodologically-similar studies have attained sample sizes ranging from 47-79 participants (Holmberg et al., 2011; Silk et al., 2011; Tan et al., 2012). As such, I sought a sample size of at least $N = 80$ participants. Additionally, though tradition suggests that sample size is more impactful than the number of

observations, I sought to minimize the presence of missingness within the data as much as possible.

Procedure

The present study sought to examine the forms of coping that participants engaged in as a response to various types of stressors that they may have encountered throughout their lives. Furthermore, this study utilized an Ecological Momentary Assessment (EMA) data sampling approach, which involves measuring the phenomena in question in real time at multiple points throughout the day (Shiffman et al., 2008). This study was made available via the SONA portal for student access; students received 6 SONA credits in total for their participation in the study. Upon signing up to be involved in the study, participants selected a 15-minute timeslot in which they met with the principal researcher over Zoom. In this meeting, the researcher walked through the informed consent document with the participant and gave the participant insight regarding what participation in the study over the course of a week would entail. At the end of this meeting, the participant completed an online entry survey that asked them to report on their trait-level self-esteem, trait-level positive affect, and trait-level negative affect. Additionally, this survey asked participants to provide demographic information and to select the week that they would prefer to participate in the week-long EMA portion of data collection, as well as their preferred method for receiving EMA surveys and contact information relevant to that. After completion of this entry survey, participants were given one (1) of their SONA credits.

For the EMA sampling protocol, participants received either a text or an email (based on their previously indicated preference) at three (3) time points throughout the day for five (5) consecutive days (Monday—Friday). Whether participants selected text or email, the message that they received at each time point contained a link that directed participants to an online

survey (<https://psych.x10host.com/ema>). This survey contained measures of primary stressor, coping strategies engaged in to combat that stressor, and state-level positive and negative affect. The three time points were evenly separated by five hours and remained the same for each day of sampling: 9 a.m., 2 p.m., and 7 p.m. Additionally, each survey was open and available for two hours. If for example, a student had a 9 a.m. class and was unable to complete the survey at the time it was delivered, they would be able to complete it as late as 11 a.m. on the same day. Each of the EMA surveys was the same and took no longer than five minutes to complete. After completion of the EMA portion of data collection, participants were given an additional five (5) SONA credits.

This sampling schedule made it so that the stressors experienced by participants throughout the day could be tapped into. Furthermore, several aspects of the above protocol aimed to alleviate the missingness that commonly poses such a large issue for EMA studies. Namely, meeting with participants one-on-one allowed the researcher to emphasize the importance of the research and the importance of completing as many surveys as they possible could. Furthermore, the flexibility of the EMA-portion of data collection allowed for by the 2-hour survey windows and the sharing of the link by either text or email allowed participants to self-select into a data sampling approach that would allow them to be as consistent as possible. Anecdotally, for instance, several students mentioned that they would be in class, so receiving the survey links via email would be very helpful in keeping them on track with the study. Finally, the brevity of the surveys allowed participants to fit them into their personal schedules more easily than would be possible with a lengthy battery of items.

It is also important to note that in each EMA survey, participants only reported on the stressors and coping strategies experienced and engaged in, respectively, during the time since

they had completed the previous survey. It was possible for particular stressors to be consistently present throughout the day or even throughout the week, and this in fact was a trend that was observed for many participants. Asking participants to only consider the time that had passed since their completion of the previous survey, facilitates developing a more accurate timeline of coping strategies. This allowed for the tracking of the most prominent stressors for any given participant as well as the tracking of how the coping strategies that they employed in response to their successes or failures evolved over time. Additionally, the degrees of positive and negative affect experienced were traceable alongside that timeline.

Measures

During the entry survey that participants completed prior to EMA-style data collection, participants reported on trait-level positive affect, and trait-level negative affect. Trait-level positive and negative affect was measured via the three highest-loading items measuring positive affect and the three highest-loading items measuring negative affect from the Positive and Negative Affect Schedule (PANAS), a 20-item questionnaire with responses on a 5-point Likert scale. The three highest-loading positive affect items asked participants to rate the extent to which they generally felt “Active,” “Determined,” and “Attentive” over the course of their day-to-day lives. The three highest-loading negative affect items asked participants to rate the extent to which they generally felt “Afraid,” “Nervous,” and “Upset” over the course of their day-to-day lives (Appendix E) (Thompson, 2007). Using the highest-loading items from the PANAS has shown psychometric properties comparable to the full scale and, crucially, allows for the reduction of participant burden that may be incurred by a lengthy survey. As has been previously described, this is particularly important when collecting data via an EMA-style

protocol. Additionally, participants were asked to provide demographic information including their age, sex, race, and ethnicity (Appendix B).

During the EMA-style portion of data collection, participants were asked to report on the primary stressor they had faced in the last several hours, which coping strategies they engaged in to combat that stressor, and their levels of state-level positive and negative affect. In order to measure stressor type, participants were asked to provide a text-based response describing the most stressful event or task that they had faced over the course of the past several hours (Appendix C). All short answer responses were analyzed and human-coded by the principal researcher as most-evident of either a workload-related stressor, an interpersonal stressor, or a stressor that didn't fit into either of these classifications, referred to as "other." For responses in which elements of multiple types of stressors were present (e.g., "My largest source of stress is balancing time to study for my exam and spend time with my friends."), the stressor would be classified as the type that was most predominant in the response (in the above example, as a workload stressor).

In order to measure coping strategies that participants engage in, nine subscales (18 total items) pulled from the Brief COPE were administered (Appendix D) (Carver, 1997). Problem-focused coping, emotion-focused coping, and avoidant coping were each represented by three subscales. The subscales selected for problem-focused coping strategies were active coping (taking steps to remove or ameliorate the stressor), instrumental support seeking (asking for help and/or advice from others), and planning (thinking of a systematic means of coping with the stressor). The subscales selected for emotion-focused coping were acceptance (accepting the reality that the stressor happened and learning to live with it), emotional support seeking (seeking moral support from others), and positive reframing (viewing a stressor in positive

terms). The subscales selected for avoidant coping were denial (refusing to believe the stressor exists), behavioral disengagement (giving up trying to manage the stressor), and self-blame (criticizing oneself for the occurrence of or reaction to the stressor). The selection of each of these subscales was based on two distinct considerations. The first was that each selected subscale was unanimously assigned to its broader coping strategy family by researchers utilizing the three-factor model for the Brief COPE, which is not the case for subscales such as venting and self-blame. The second was that each selected subscale could feasibly be exercised in a variety of contexts without any practical barriers or hurdles, except in very unique circumstances. The same cannot be said for substance use which, while widely perceived as an avoidant strategy, usually cannot be engaged in across all situations due to reasons related to accessibility and accountability.

Each of these 18 total items referred to a given behavior and asked participants to consider how often they had engaged in that behavior to cope with the primary stressor that they had provided. Each item was measured on a 4-point scale with the following labels: 1 = I haven't been doing this at all; 2 = A little bit; 3 = A medium amount; 4 = I've been doing this a lot. The scores are presented as averages, indicating the degree to which the given coping style had been engaged in by the respondent. The interpretation of scores can be aided by looking at the pattern of responses across the three broader subscales. If a given participant has consistently low scores on all subscales, for instance, it may indicate that they may feel as though they don't have many stressors to cope with, that they have a lack of reflective capacity or a resistance to disclose information of a personal nature, or that they don't have an extensive repertoire of coping strategies. Positive and negative affect is the outcome of interest that was used to gauge the effectiveness of whatever coping strategies participants engaged in. At each measurement time

point, participants finished their questionnaire by reporting the positive affect and the negative affect that they had experienced over the course of the last several hours. They did so via the same three highest-loading positive affect items and three highest-loading negative affect items from the PANAS (Appendix E).

Analyses

The data that were collected from the previously described approaches are conducive to a Multilevel Structural Equation Model (MSEM)—specifically, a 2-level MSEM with participants serving as the higher level of analysis and the fifteen time points nested within each participant serving as the lower level of analysis. Generally speaking, multilevel models are often popular in large part due to their ability to recognize the existence of data hierarchies, specifically by allowing for residual components at each level of analysis. This partitions residual variance into both a between- and within- component. MSEMs, in particular, are commonly used in studies utilizing nested data structures. In the case of the present study, there are a couple of factors that contribute to the degree of model complexity. Among these are the nature of the data nesting, which comes from a longitudinal orientation and the nature of the hypotheses and overall aims of the research in general, which examine autoregressive paths, cross-lagged paths, and moderation paths. The incorporation of all of these paths led me to a specific type of MSEM known as a cross-lagged panel model (CLPM).

CLPMs are useful for examining temporal relationships between variables measured at multiple time points while simultaneously accounting for the nested structure of data. This allows for the investigation of the directionality and strength of relationships between variables over time and allows for the testing of complex theoretical models (Hamaker et al., 2015). That ability to capture temporal dynamics is one of the key advantages of CLPMs. The estimation of

autoregressive paths allows for the assessment of the stability of variables over time. This helps to establish temporal precedence and provides insight into whether changes in one variable are related to changes in another. CLPMs also allow for the estimation of cross-lagged paths, which showcase the directionality of relationships between the same or different variables at different time points. This can help to establish underlying mechanisms and relationships that drive any observed patterns of association. The easy handling and accommodation of temporal dynamics also makes CLPMs a strong choice when investigating even more complex relationships. These include reciprocal relationships, bidirectional causality, mediation effects, and moderation effects.

The nature of the data having been collected at multiple time points nested within individuals means that the model equations for CLPM must reflect not only the variables of interest, but also the time points at which those variables were measured. The main idea is to estimate autoregressive paths and cross-lagged paths, and to incorporate consideration of the moderation effects into both types of models. The autoregressive path equations can be expressed as:

$$A_t = \gamma_{00} + \gamma_{01} * A_{t-1} + \gamma_{02} * M_t + \varepsilon_{A_t}$$

$$B_t = \gamma_{10} + \gamma_{11} * B_{t-1} + \gamma_{12} * M_t + \varepsilon_{B_t}$$

where A_t represents the value of variable A at time point t, B_t represents the value of variable B at time point t, A_{t-1} represents the value of variable A at the previous time point, B_{t-1} represents the value of B at the previous time point, and M_t represents the value of the moderator variable at time point t. Additionally, γ_{00} and γ_{11} are the autoregressive coefficients

for Variables A and B, respectively, and γ_{02} and γ_{12} are the coefficients representing the moderation effects of the moderator variable on the autoregressive paths of Variable A and Variable B, respectively. The autoregressive coefficients γ_{00} and γ_{11} represent the stability of each variable over time. The coefficients γ_{02} and γ_{12} represent how the strength or direction of the autoregressive paths may vary as a function of the moderator variable. Finally, ε_{At} and ε_{Bt} are the error terms that represent the unexplained variance or random fluctuations in Variables A and B at time point t, respectively. The cross-lagged path equations are subsequently modeled as:

$$B_t = \gamma_{20} + \gamma_{21} * A_{t-1} + \gamma_{22} * M_t + \varepsilon_{Bt}$$

$$A_t = \gamma_{30} + \gamma_{31} * B_{t-1} + \gamma_{32} * M_t + \varepsilon_{At}$$

where the first equation represents the influence of Variable A on Variable B, and the second represents the influence of Variable B on Variable A. Within these equations, γ_{20} and γ_{21} represent the cross-lagged coefficients for the influence of Variable A on Variable B, and γ_{30} and γ_{31} represent the cross-lagged coefficients for the influence of Variable B on Variable A. All four of these coefficients represent the directionality and strength of the relationships between the variables at different time points. Additionally, γ_{22} and γ_{32} are the coefficients representing the moderation effects of the moderator variable on the cross-lagged paths, which indicate how the strength or the direction of the cross-lagged relationships vary depending on the moderator variable. The covariances between error terms can be represented by the following equation:

$$Cov(\varepsilon_{A_t}, \varepsilon_{B_t}) = \theta_{ab}$$

Specifically, this equation shows the covariance between the error terms of Variable A and Variable B at time point t, denoted by θ_{ab} . This term accounts for the potential correlated or shared variance between the error terms of the two variables at the same time point. The residual variances can be represented by the following equations:

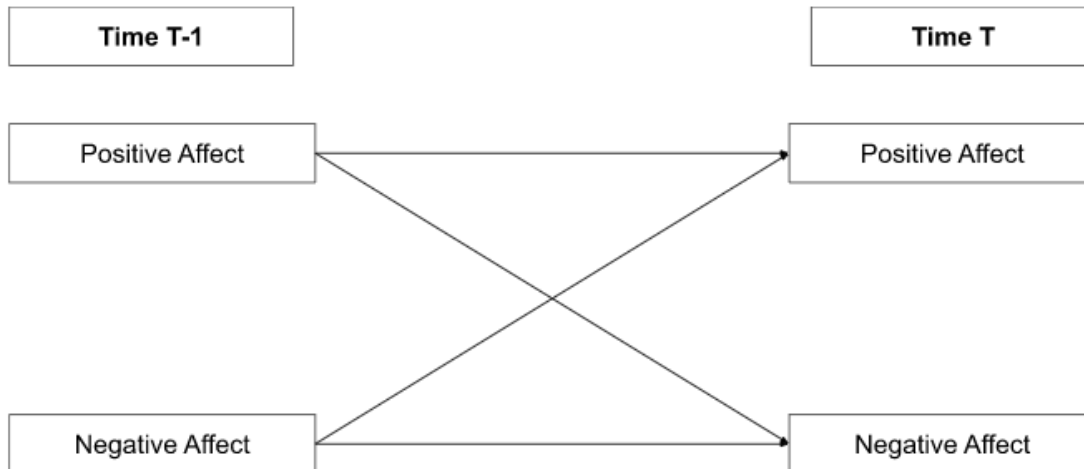
$$Var(\varepsilon_{A_t}) = \sigma_a^2$$

$$Var(\varepsilon_{B_t}) = \sigma_b^2$$

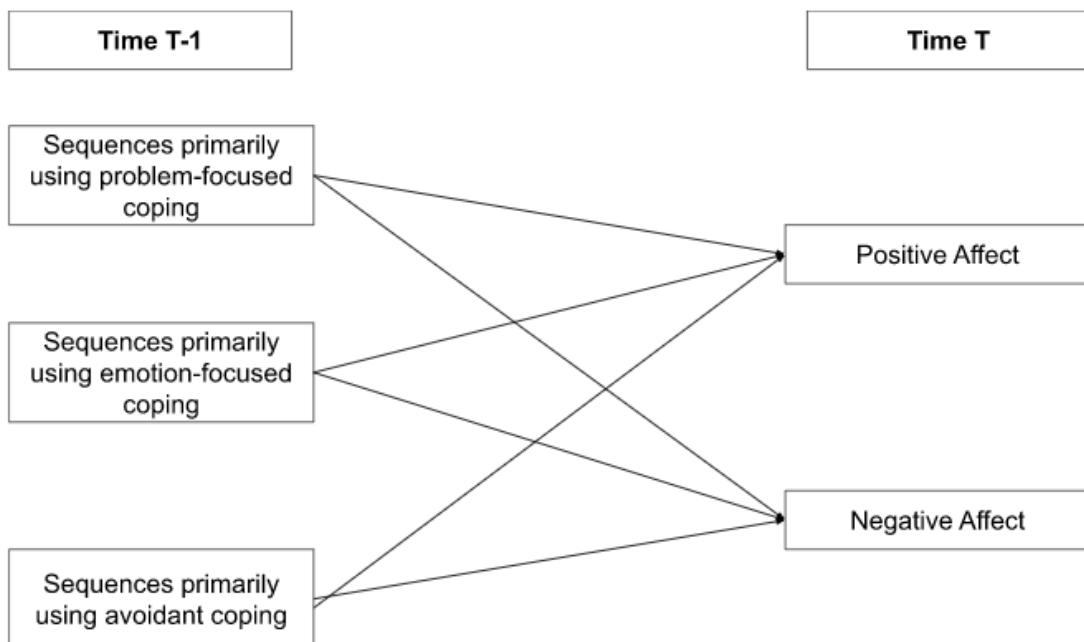
Specifically, these equations represent the residual variances of Variable A and Variable B at time point t, denoted as σ_{a2} and σ_{b2} respectively. These terms represent the unexplained variance or random fluctuations in each variable at each time point. These equations allow for the estimation of the autoregressive and cross-lagged relationships, accounting for the temporal dynamics that are of particular interest in the present study. Furthermore, these equations can account for the potential moderating role of a variable on the relationships between variables over time. This provides a more nuanced understanding of how the relationships between variables may vary as a function of the moderator variable.

These paths can be represented visually, as well. Keeping in mind that positive affect and negative affect are considered the indicators of effective or ineffective coping in the context of the present study, they are the outcomes of interest indicated in the subsequent graphics at Time T. The autoregressive paths for positive and negative affect, as well as the cross-lagged

paths for affect alone (indicating the impact of positive affect on negative affect and vice versa) are visualized as:



And the cross-lagged paths for each form of coping on positive and negative affect are visualized as:



Multilevel models such as the CLPM may be applied when events are repeatable (as is the case for stressors or coping strategies that may be experienced or engaged in, respectively,

more than once). This allows for the consideration of the potential correlation between the responses provided by the same individual (Shipley, 2009). Additionally, multilevel models offer the advantage of a tendency toward correct inferences. Traditional multiple regression techniques fail to recognize hierarchical structures and, as such, treat the units of analysis as independent observations. Consequently, the standard errors of regression coefficients tend to be underestimated—this leads to an overstatement of statistical significance (Hair Jr & Favero, 2019).

For the purpose of exploring my research question and to provide contextual details surrounding the nature of the stressors that participants reported on, an LDA was conducted on the open-text responses provided by participants reflecting on their primary source of stress (Blei et al., 2003). The LDA allows us to take a deeper look at the underlying themes, specifically allowing us to see what aspects of workload and interpersonal stressors and what types of stressors classified as “other” were particularly stressful to participants. LDA is analogous to confirmatory factor analysis (CFA) or latent profile analysis (LPA), because it seeks to simultaneously model the observed distribution based on a predefined model of latent variables as well as the membership of each case to that set of variables. Similar to CFA and LPA, researchers often take a model fitting/comparison approach to identify the best underlying model structure. I therefore tested a series of LDA models varying the number of topics from 2 to 11. I also varied the alpha and beta hyperparameters, which control how small vs large the number of cases (alpha) or words (beta) are assigned to a given topic. More directly, alpha refers to document-topic density and beta refers to topic-word density. Varying these hyperparameters allows us to empirically discover more optimal models and is similar to varying the distributional constraints within an LPA.

Data Coding

For sequencing purposes, the values for positive and negative affect obtained from the first measurement time on the first day of EMA-style data collection were compared to the trait-level positive and negative affect measured at the entry survey. For the subsequent measurement times throughout that day, positive and negative affect were compared to the levels measured at the most recent measurement time. For the first measurement time in subsequent days, the levels of positive and negative affect were compared to the scores obtained by the final measure on the preceding day. Coping that was considered very effective was operationalized as trends toward high levels of positive affect and low levels of negative affect relative to baseline measures. Coping that was considered moderately effective was operationalized as trends towards either high levels of both positive and negative affect or low levels of both positive and negative affect relative to baseline measures. Finally, coping that was considered ineffective was operationalized as trends towards low levels of positive affect and high levels of negative affect relative to baseline measures.

After the data had been collected, the stressors provided by the participants at each time point were manually coded by me and classified either as an interpersonal stressor, a workload stressor, or an “other” stressor that didn’t match either of these classifications. As is later described in the “Descriptive Analyses” section of the results, there was an imbalance of stressor type presence such that workload-related stressors were much more prominent than either of the other two classes, accounting for two-thirds of all stressors. As such, the stressors for each time point were dummy coded such that an interpersonal stressor was compared to both workload and “other,” stressors, which were coded together. Likewise, the analysis of workload stressors involved comparing those stressors to both interpersonal and “other” stressors, which were coded

together. Additionally, composite scores were calculated for the measures of problem-focused coping, emotion-focused coping, and avoidant coping, as well as for the measures of positive affect and negative affect. For data cleaning, I removed participants for whom 20% or more of surveys were missing or incomplete. This reduced the sample size from an initial $N = 93$ participants to $N = 83$ participants. The final step of data preprocessing came in the conversion of the dataset to wide format, in which each row of data represents a single higher-level observation (in this case, a single participant) and all lower-level observations (in this case, time points) have their own column within that single row (Barendse & Rosseel, 2020). It is common practice to convert data to wide format in preparation for analyses such as growth curve modeling, structural equation modeling, and many multilevel analyses in general (Grimm et al., 2016). The CLPM for the present study was specified using the ‘lavaan’ package in R, which is a popular package for performing various types of analyses relevant to structural equation modeling (Rosseel, 2012). The framework that it provides is comprehensive and allows for the specification, estimation, and interpretation of latent and observed variables alike. The inclusion of the moderator coefficients initially presented issues with the analysis of model specification fit. These could not be remediated by specifying “full information maximum likelihood” for the “missing” argument alone, as there were convergence issues that were due to missing values in the categorical exogenous variables related to stressor type. Even still, this poses fewer issues for lavaan than categorical variables that are endogenous and can often be corrected via data imputation prior to model specification (Rosseel, 2014). As such, I used the mice package in R to impute for the missing values. Mice is an acronym for Multivariate Imputation by Chained Equations; the package utilizes multiple imputation using fully conditional specification, in which each variable has its own imputation model (van Buuren & Groothuis-Oudshoorn, 2011). The mice package

usefully includes built-in imputation models for continuous data, binary data, and categorical data that is either ordered or unordered. Largely due to its versatility in handling all types of data across levels, mice is commonly used to impute data for multilevel models (Grund et al., 2018; Resche-Rigon & White, 2018). I utilized the random forest method of imputation available through the mice package. Random forest imputation is a machine learning technique that accommodates nonlinearities and interactions and does not necessitate the specification of a particular regression model (Shah et al., 2014). Random forest has been supported as an efficient imputation approach that can produce unbiased estimates and produce narrow confidence intervals, making it a popular choice for imputing complex datasets in which there is missingness. The perspectives on the number of datasets to impute (m) vary quite a lot; Schafer and Olsen (1998) argue that there, “is simply little advantage to producing and analyzing more than a few imputed datasets” when considering the additional computation and storage necessary for imputing a large number of datasets. Graham et al. (2007) later argued that m should be set to at least 20, but potentially as many as 100 depending on the degree of statistical power that is needed. One rule of thumb that is seen in later arguments, striking a middle ground between these perspectives, is that m should be roughly near the percentage of cases that are incomplete (van Buuren, 2023; Von Hippel, 2009; White et al., 2011). Because I had a sample of 83 participants who could have potentially completed as many as 15 surveys apiece, the total number of possible level-1 observations was $N = 1,245$. The total number of actual level-1 observations was 1,074, meaning that about 14% of level-1 observations were missing. Using the aforementioned missingness percentage approach, I imputed 10 different datasets with a maximum of 100 iterations and averaged across those 10 imputations to obtain the final dataset that would be used to evaluate the fit of the CLPM model specification.

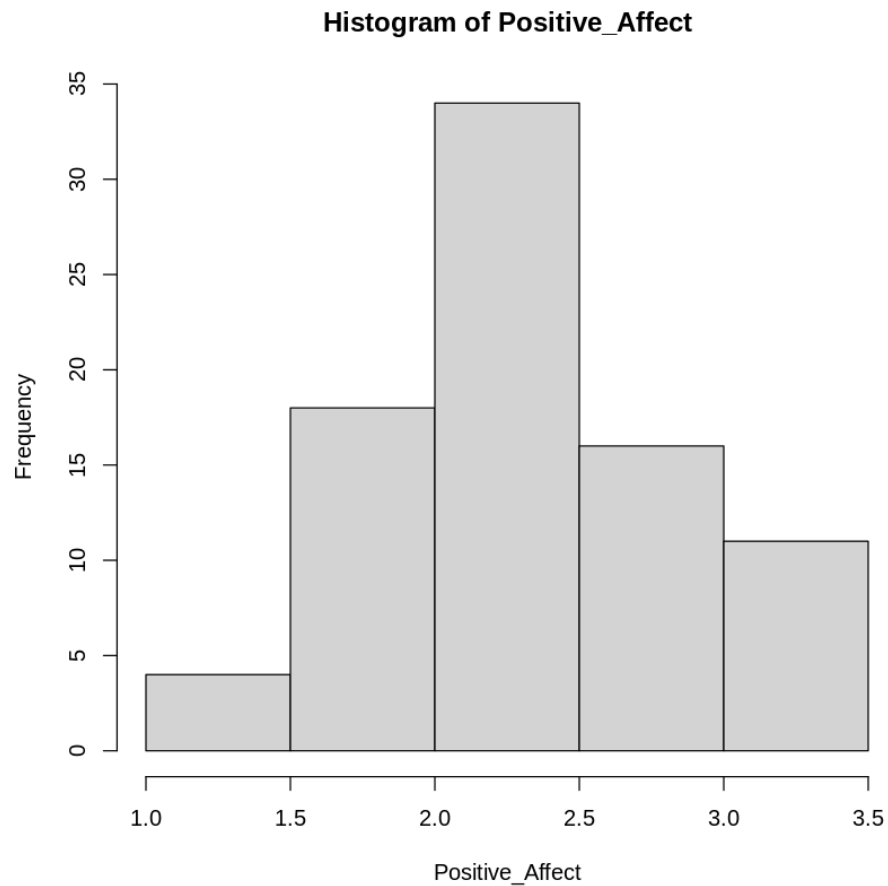
Results

Descriptive Analyses

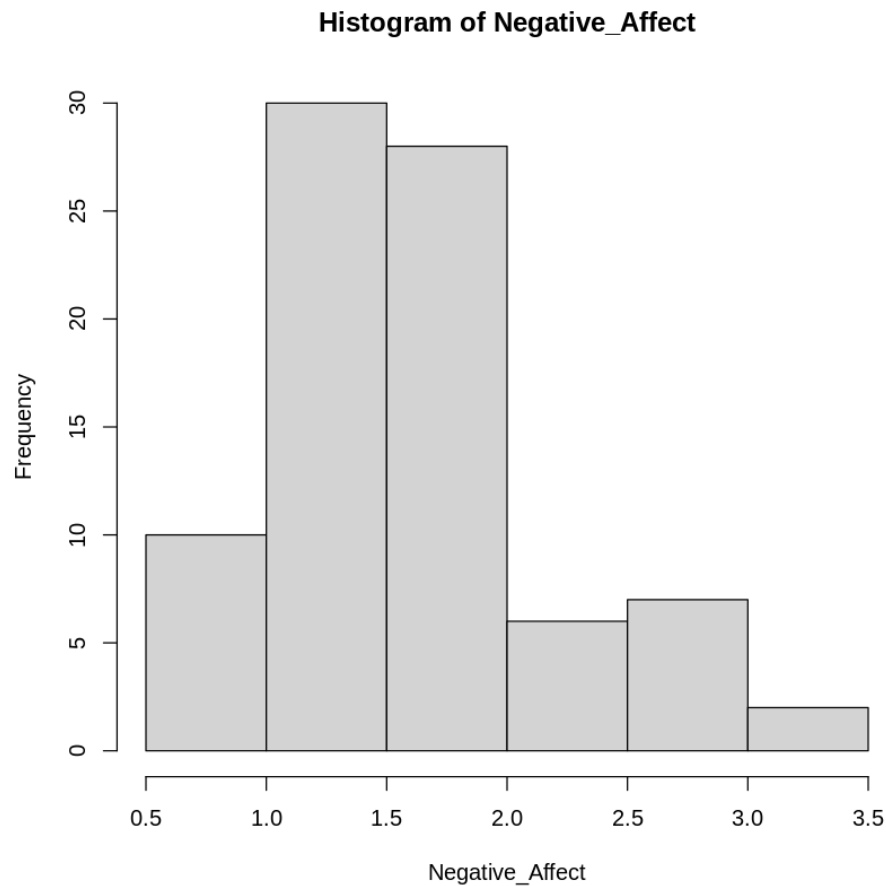
A total of $N = 93$ participants were collected over a span of three weeks in February and March of 2023. This sample was predominantly female and (non Hispanic/Latinx) white. Specifically, 74 participants were female (80% of sample), 81 participants reported not identifying as Hispanic or Latinx (87% of sample), and 68 participants identified as White or Caucasian (73% of sample). Across these 93 participants, there were a total of 1,256 stressors reported, or an average of 13.5 stressors per participant of a total possible 15. Of these stressors, the vast majority were researcher-coded as workload-related stressors; 829 stressors were coded as workload-related stressors (66% of all reported stressors), 191 stressors were coded as interpersonal stressors (15.2% of all reported stressors), and 236 stressors were coded as other stressors (18.8% of all reported stressors). Participants for whom 20% of data or more were missing were excluded from subsequent analyses. This resulted in a final sample of $N = 83$ participants for the purposes of modeling and text analysis.

Distributions

Considering the outcomes of interest for this study were positive and negative affect, it was useful to understand the distribution of individual scores when averaging positive affect and averaging negative affect across all time points. Understanding the frequency of scores at various levels of both outcomes of interest allow for a more holistic interpretation of the findings related to those outcomes. The distribution of individual scores for positive affect averaged across all 15 time points is represented below:



The majority of participants averaged at a moderate level of positive affect, and the above distribution fits decently well with a normal distribution. The distribution of individual scores for negative affect averaged across all 15 time points is represented below:



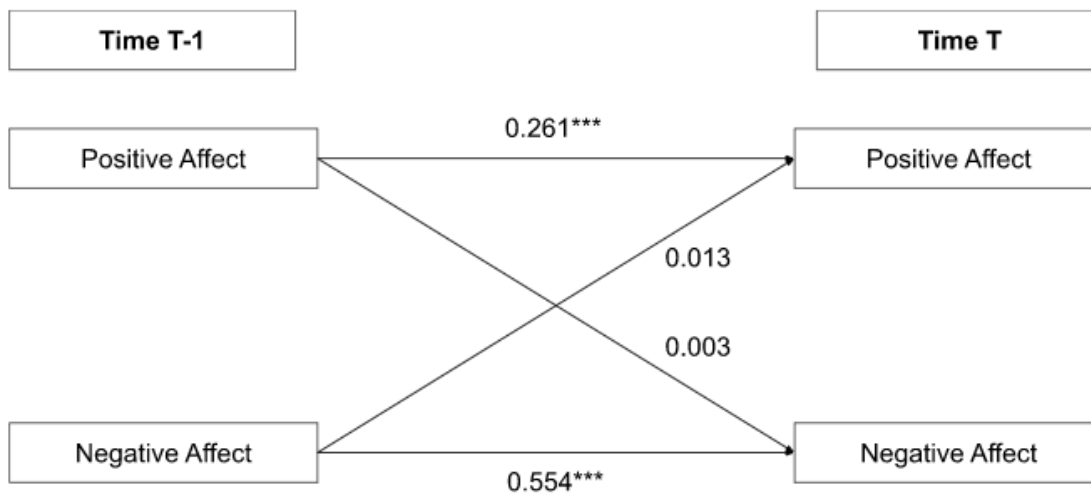
Unlike positive affect, the majority of participants averaged at a low level of negative affect, most commonly between an average of 1 and 2 per time point. Furthermore, the distribution as a whole is much more positively skewed than was the case for positive affect. This means that the outliers for negative affect scores are much more likely to be on the high side. Again, these distributions are impactful to the relationships between the constructs of interest and the outcomes in question. As such, being mindful of how these scores typically present helps frame the subsequent analyses.

Reliability Metrics

For modeling purposes, composite scores were generated for the Brief COPE subscales aimed at evaluating problem-focused coping, emotion-focused coping, and avoidant coping. Composite variables representing the subscale facet were calculated by taking the average score across all items within a subscale. The problem-focused coping subscale consisted of 6 items ($\alpha = 0.83$), the emotion-focused subscale consisted of 6 items ($\alpha = 0.69$), and the avoidant coping subscale also consisted of 6 items ($\alpha = 0.70$). This was also the case for the 3 highest-loading positive affect items ($\alpha = 0.83$) and the 3 highest-loading negative affect items ($\alpha = 0.78$) from the PANAS.

Autoregressive and Cross-Lagged Paths

The autoregressive path coefficients and cross-lagged path coefficients for positive affect and negative affect are represented below:



These coefficients reflect the strength and the direction of the associations between affective states at adjacent time points; they reflect the average across all 15 time points. These

coefficients indicate the magnitude of the expected change in affect at time T, on average, in response to a one-unit increase in affect at time T-1, holding all else constant.

The coefficient for positive affect at time T-1 on positive affect at time T was $B = 0.261$, $p < 0.001$, 95% CI: [0.174, 0.349]. Due to its positivity, this coefficient suggests that higher levels of positive affect at time T-1 tend to be associated with higher levels of positive affect at time T. Specifically, this coefficient suggests that a one-unit increase in positive affect at time T-1, on average, results in an increase in positive affect of 0.261 at time T.

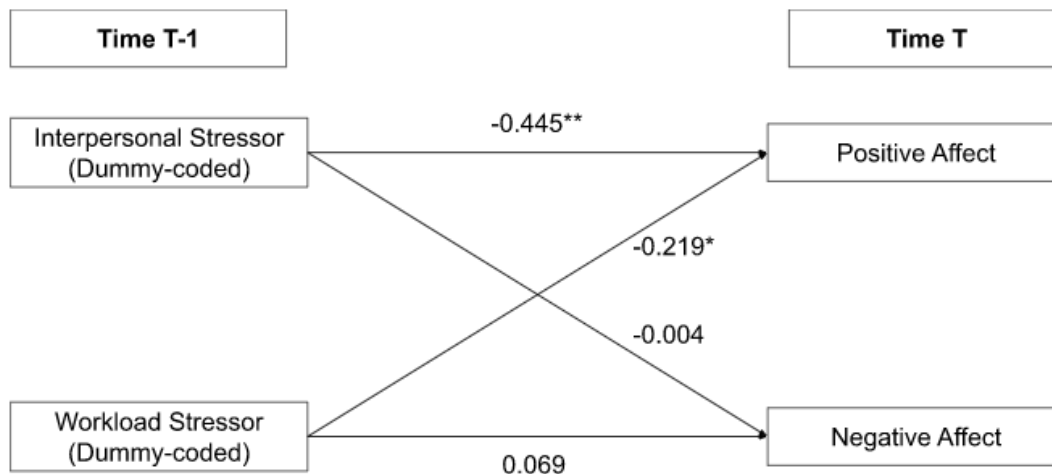
The coefficient for negative affect at time T-1 on negative affect at time T was $B = 0.554$, $p < 0.001$, 95% CI: [0.473, 0.635]. Again, due to its positivity, this coefficient suggests that higher levels of negative affect at time T-1 tend to be associated with higher levels of negative affect at time T. Specifically, this coefficient suggests that a one-unit increase in negative affect at time T-1, on average, results in an increase in negative affect of 0.554 at time T.

Regarding the cross-lagged affective paths, the coefficient for positive affect at time T-1 on negative affect at time T was $B = 0.003$, $p = .9267$, 95% CI: [-0.066, 0.072]. This coefficient suggests that a one-unit increase in positive affect at time T-1, on average, results in an increase in negative affect of 0.003 at time T. With that having been said, this coefficient value is near-zero and the 95% confidence interval crosses the boundary of positivity and negativity. Furthermore, the p-value does not suggest significance, which poses further difficulties with estimating how positive affect at time T-1 impacts negative affect at time T.

The coefficient for negative affect at time T-1 on positive affect at time T was $B = 0.013$, $p = 0.7591$, 95% CI: [-0.076, 0.102]. This coefficient suggests that a one-unit increase in negative affect at time T-1, on average, results in an increase in positive affect of 0.013 at time T.

Again, though, the same difficulties that presented themselves for the cross-lagged path from positive affect to negative affect crop up again here. As such, this result should be interpreted with caution.

The cross-lagged path coefficients for interpersonal and workload stressors on positive and negative affect are below:



These coefficients reflect the strength and the direction of the associations between stressors and affective states at adjacent time points; they reflect the average across all 15 time points. These coefficients indicate the magnitude of the expected change in affect at time T, on average, in response to the presence of an interpersonal or workload stressor at time T-1, holding all else constant.

The coefficient for interpersonal stressors at time T-1 on positive affect at time T was $B = -0.445$, $p = 0.0050$, 95% CI: $[-0.732, -0.158]$. Due to its negativity, this coefficient suggests that the presence of an interpersonal stressor at time T-1 tends to be associated with lower levels of positive affect at time T. Specifically, this coefficient suggests that the presence of an

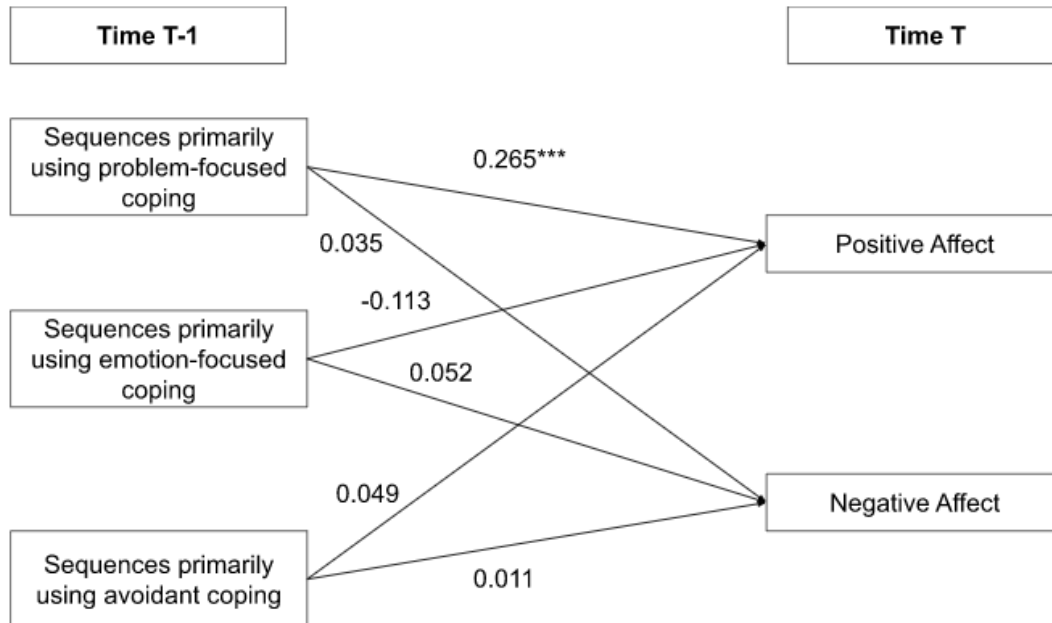
interpersonal stressor at time T-1, on average, results in a decrease in positive affect of 0.445 at time T.

The coefficient for interpersonal stressors at time T-1 on negative affect at time T was $B = -0.004$, $p = 0.9736$, 95% CI: [-0.259, 0.251]. This coefficient suggests that the presence of an interpersonal stressor at time T-1 results, on average, in a decrease in negative affect of 0.004. Due to the near-zero coefficient value, non-significant p-value, and presence of positivity and negativity in the 95% confidence interval, this result should be interpreted with caution.

The coefficient for workload stressors at time T-1 on positive affect at time T was $B = -0.219$, $p = 0.0439$, 95% CI: [-0.431, -0.007]. Due to its negativity, this coefficient suggests that the presence of a workload-related stressor at time T-1 tends to be associated with lower levels of positive affect at time T. Specifically, this coefficient suggests that the presence of a workload stressor at time T-1, on average, results in a decrease in positive affect of 0.219 at time T.

The coefficient for workload stressors at time T-1 on negative affect at time T was $B = 0.069$, $p = 0.3972$, 95% CI: [-0.100, 0.238]. This coefficient suggests that the presence of a workload-related stressor at time T-1, on average, results in an increase in negative affect of 0.069 at time T. Issues with the significance of the coefficient and the presence of positivity and negativity in the 95% confidence interval suggest that this result should be interpreted with caution.

The cross-lagged path coefficients for coping strategies on positive and negative affect are below:



These coefficients reflect the strength and the direction of the associations between coping sequences and affective states at adjacent time points; they reflect the average across all 15 time points. These coefficients indicate the magnitude of the expected change in affect at time T, on average, in response to a one-unit increase in problem-focused coping, emotion-focused coping, or avoidant coping at time T-1, holding all else constant.

The coefficient for sequences primarily using problem-focused coping at time T-1 on positive affect at time T was $B = 0.265$, $p = 0.0004$, 95% CI: [0.143, 0.387]. Due to its positivity, this coefficient suggests that higher levels of problem-focused coping at time T-1 tends to be associated with higher levels of positive affect at time T. Specifically, this coefficient suggests that a one-unit increase in problem-focused coping at time T-1, on average, results in an increase in positive affect of 0.265 at time T.

The coefficient for sequences primarily using problem-focused coping at time T-1 on negative affect at time T was $B = 0.035$, $p = 0.4895$, 95% CI: [-0.071, 0.141]. This coefficient

suggests that a one-unit increase in problem-focused coping at time T-1, on average, results in an increase in positive affect of 0.035 at time T. This result should be interpreted with caution due to the non-significant p-value and presence of positivity and negativity in the 95% confidence interval.

The coefficient for sequences primarily using emotion-focused coping at time T-1 on positive affect at time T was $B = -0.113$, $p = 0.1158$, 95% CI: [-0.258, 0.032]. This coefficient suggests that a one-unit increase in emotion-focused coping at time T-1, on average, results in a decrease in positive affect of 0.113 at time T. This result should be interpreted with caution due to the non-significant p-value and presence of positivity and negativity in the 95% confidence interval.

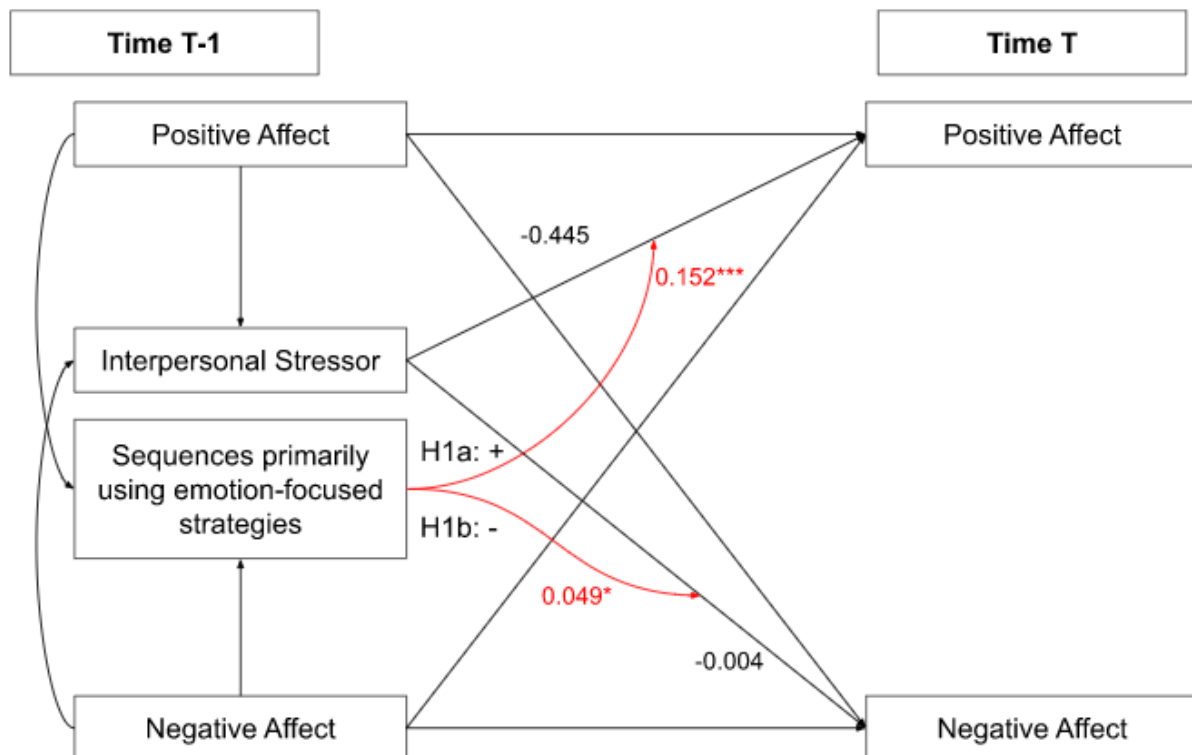
The coefficient for sequences primarily using emotion-focused coping at time T-1 on negative affect at time T was $B = 0.052$, $p = 0.3192$, 95% CI: [-0.056, 0.160]. This coefficient suggests that a one-unit increase in avoidant coping at time T-1, on average, results in an increase in negative affect of 0.052 at time T. This result should be interpreted with caution due to the non-significant p-value and presence of positivity and negativity in the 95% confidence interval.

The coefficient for sequences primarily using avoidant coping at time T-1 on positive affect at time T was $B = 0.049$, $p = 0.5104$, 95% CI: [-0.107, 0.205]. This coefficient suggests that a one-unit increase in avoidant coping at time T-1, on average, results in an increase in positive affect of 0.049 at time T. This result should be interpreted with caution due to the non-significant p-value and presence of positivity and negativity in the 95% confidence interval.

The coefficient for sequences primarily using avoidant coping at time T-1 on negative affect at time T was $B = 0.011$, $p = 0.8671$, 95% CI: [-0.127, 0.149]. This coefficient suggests that a one-unit increase in avoidant coping at time T-1, on average, results in an increase in negative affect of 0.011 at time T. This result should be interpreted with caution due to the non-significant p-value and presence of positivity and negativity in the 95% confidence interval.

Hypothesis Testing – Moderation Models

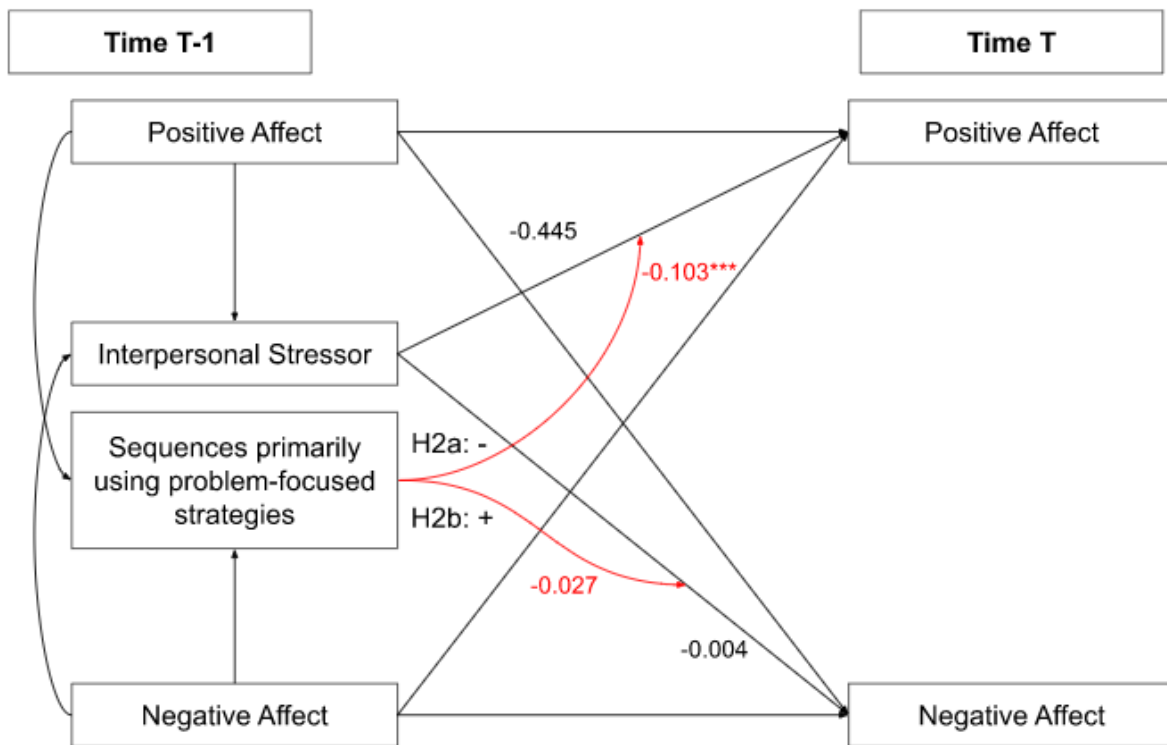
The moderation path coefficients to examine the moderation effect of sequences primarily using emotion-focused coping strategies on the relationship between interpersonal stressors at time T-1 and positive and negative affect at time T are represented in the model below:



The moderation coefficient for sequences primarily using emotion-focused coping at time T-1 on the relationship between interpersonal stressor presence at time T-1 and positive affect at time T was $B = 0.152$, $p < 0.001$, 95% CI: [0.114, 0.190]. The positive value of this coefficient suggests that higher levels of emotion-focused coping at time T-1 weaken the relationship between interpersonal stressors at time T-1 and positive affect at time T. Because the cross-lagged coefficient between interpersonal stressor and positive affect is -0.445, this finding suggests that engaging in more emotion-focused strategies may have buffered the negative effect of interpersonal stressors on positive affect. Because this coefficient was significant at $p < 0.001$, Hypothesis 1a was *supported*.

The moderation coefficient for sequences primarily using emotion-focused coping at time T-1 on the relationship between interpersonal stressor presence at time T-1 and negative affect at time T was $B = 0.049$, $p = 0.0122$, 95% CI: [0.012, 0.086]. Because the cross-lagged coefficient between interpersonal stressor and negative affect is -0.004, the positive value of this coefficient suggests that higher levels of emotion-focused coping at time T-1 are associated with a weaker relationship between interpersonal stressors at time T-1 and negative affect at time T. Specifically, this finding suggests that engaging in more emotion-focused strategies may have buffered the negative effect of interpersonal stressors on negative affect. It is important to interpret this finding while considering both the small magnitude of the cross-lagged coefficient in question. The practical significance of this finding may be limited due to that small effect size. Considering that small cross-lagged coefficient alongside a moderation coefficient that is positive as opposed to the hypothesized negative moderation coefficient, Hypothesis 1b was *not supported* despite that moderation coefficient being significant at $p < 0.05$.

The moderation path coefficients to examine the moderation effect of sequences primarily using problem-focused coping strategies on the relationship between interpersonal stressors at time T-1 and positive and negative affect at time T are represented in the model below:

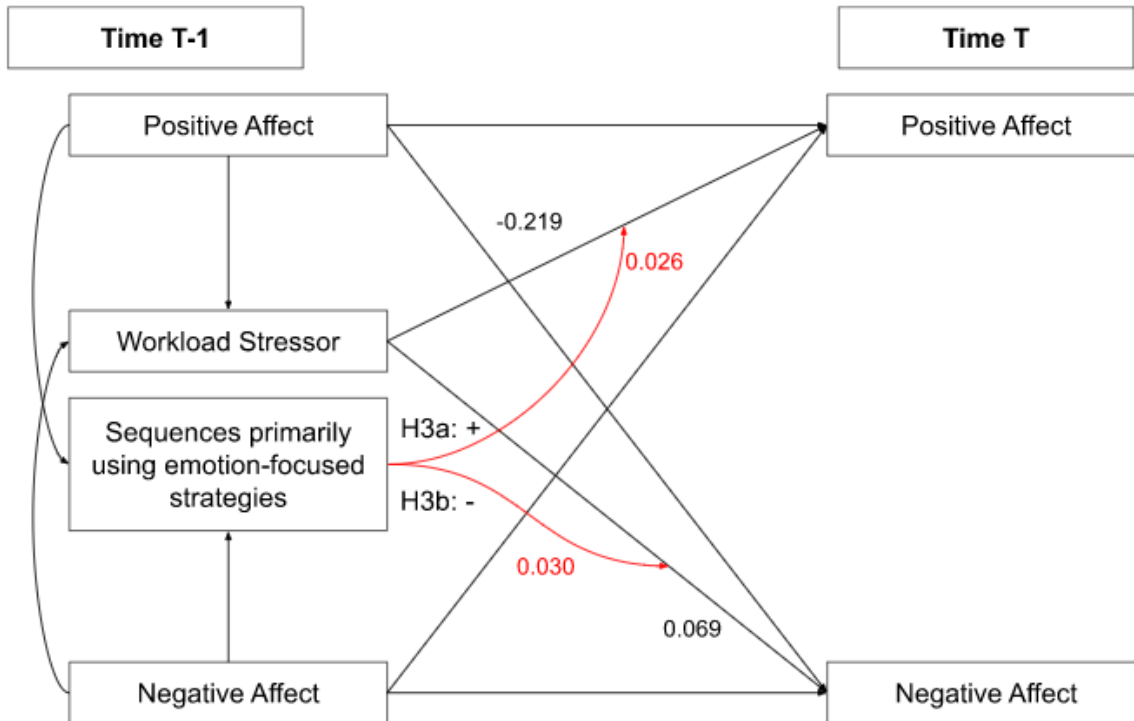


The moderation coefficient for sequences primarily using problem-focused coping at time T-1 on the relationship between interpersonal stressor presence at time T-1 and positive affect at time T was $B = -0.103$, $p < 0.001$, 95% CI: [-0.141, -0.065]. The negative value of this coefficient suggests that higher levels of problem-focused coping at time T-1 amplify the relationship between interpersonal stressors at time T-1 and positive affect at time T. Because the cross-lagged coefficient between interpersonal stressor and positive affect is -0.445, this finding suggests that engaging in more problem-focused strategies may have intensified the negative

effect of interpersonal stressors on positive affect. Because this coefficient was significant at $p < 0.001$, Hypothesis 2a was *supported*.

The moderation coefficient for sequences primarily using problem-focused coping at time T-1 on the relationship between interpersonal stressor presence at time T-1 and negative affect at time T was $t(14) = -0.027$, $p = 0.1354$, 95% CI: [-0.064, 0.010]. Because the cross-lagged coefficient between interpersonal stressor and negative affect is -0.004, the negative value of this moderation coefficient suggests that higher levels of problem-focused coping at time T-1 are associated with a stronger relationship between interpersonal stressors at time T-1 and negative affect at time T. Specifically, this finding suggests that engaging in more problem-focused strategies may have intensified the negative effect of interpersonal stressors on negative affect. Again, though, the small magnitude of the cross-lagged coefficient in question should be considered while interpreting this finding. Considering that small cross-lagged coefficient, a moderation coefficient that is negative as opposed to the hypothesized positive moderation coefficient, and a non-significant p-value, Hypothesis 2b was *not supported*.

The moderation path coefficients to examine the moderation effect of sequences primarily using emotion-focused coping strategies on the relationship between workload stressors at time T-1 and positive and negative affect at time T are represented in the model below:

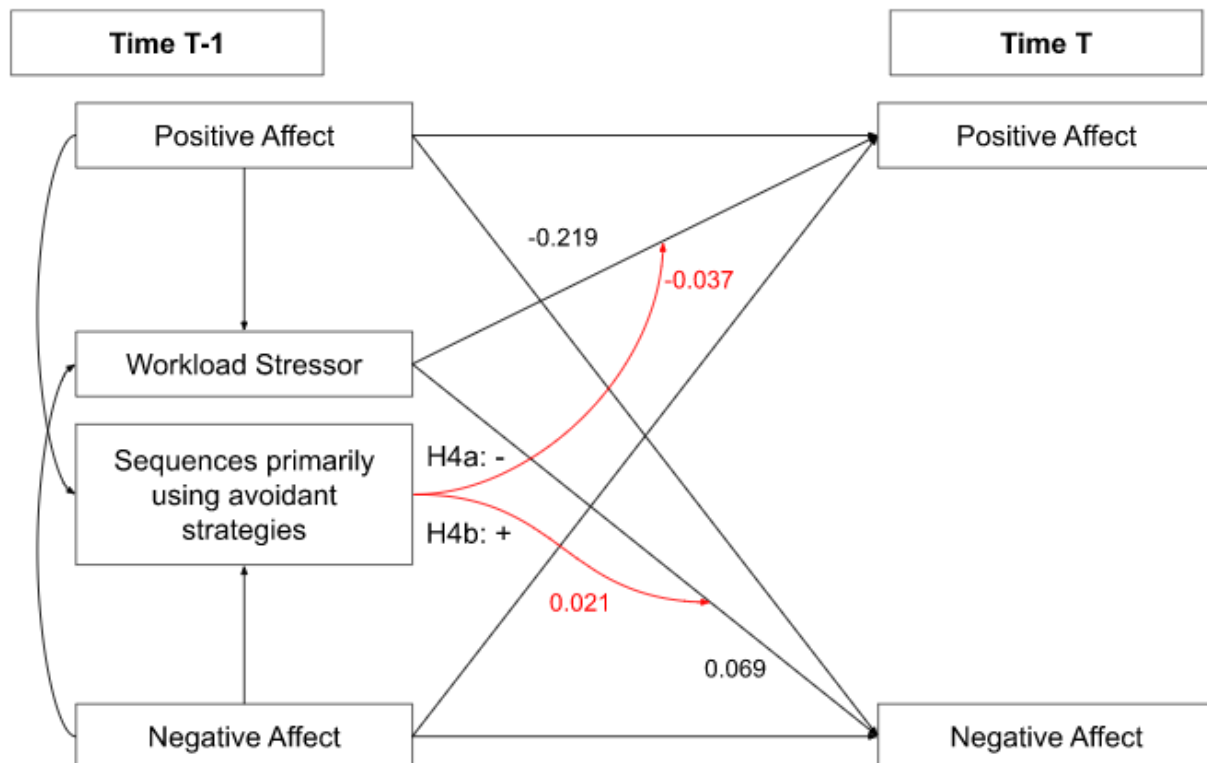


The moderation coefficient for sequences primarily using emotion-focused coping at time T-1 on the relationship between workload stressor presence at time T-1 and positive affect at time T was $B = 0.036$, $p = 0.0842$, 95% CI: [-0.006, 0.078]. The positive value of this coefficient suggests that higher levels of emotion-focused coping at time T-1 buffer the relationship between workload stressors at time T-1 and positive affect at time T. Because the cross-lagged coefficient between workload stressor and positive affect is -0.219, this finding suggests that engaging in more emotion-focused strategies may have slightly buffered the negative effect of workload stressors on positive affect. However, considering that the p-value is non-significant, Hypothesis 3a was *not supported*.

The moderation coefficient for sequences primarily using emotion-focused coping at time T-1 on the relationship between workload stressor presence at time T-1 and negative affect at time T was $B = 0.020$, $p = 0.3192$, 95% CI: [-0.022, 0.062]. The positive value of this coefficient

suggests that higher levels of emotion-focused coping at time T-1 amplify the relationship between workload stressors at time T-1 and negative affect at time T. Because the cross-lagged coefficient between workload stressor and negative affect is 0.069, this finding suggests that engaging in more emotion-focused strategies may have slightly intensified the positive effect of workload stressors on negative affect. Considering the moderation coefficient is positive as opposed to the hypothesized negative moderation coefficient while also considering that the p-value is non-significant, Hypothesis 3b was *not supported*.

The moderation path coefficients to examine the moderation effect of sequences primarily using avoidant coping strategies on the relationship between workload stressors at time T-1 and positive and negative affect at time T are represented in the model below:



The moderation coefficient for sequences primarily using avoidant coping at time T-1 on the relationship between workload stressor presence at time T-1 and positive affect at time T was $B = -0.037$, $p = 0.0767$, 95% CI: [-0.079, 0.005]. The negative value of this coefficient suggests that higher levels of avoidant coping at time T-1 increase the strength of the relationship between workload stressors at time T-1 and positive affect at time T. Because the cross-lagged coefficient between workload stressor and positive affect is -0.219, this finding suggests that engaging in more avoidant strategies may have slightly amplified the negative effect of workload stressors on positive affect. Considering the non-significance of the p-value, however, Hypothesis 4a was *not supported*.

The moderation coefficient for sequences primarily using avoidant coping at time T-1 on the relationship between workload stressor presence at time T-1 and negative affect at time T was $B = 0.021$, $p = 0.2965$, 95% CI: [-0.021, 0.063]. The positive value of this coefficient suggests that higher levels of avoidant coping at time T-1 amplify the relationship between workload stressors at time T-1 and negative affect at time T. Because the cross-lagged coefficient between workload stressor and negative affect is 0.069, this finding suggests that engaging in more avoidant strategies may have slightly intensified the positive effect of workload stressors on negative affect. Again, though, the p-value for this moderation coefficient is non-significant. Therefore, Hypothesis 4b was *not supported*.

Latent Dirichlet Allocation (LDA)

In total, 270 LDA models were fit to the open-text stressor responses. 80% of the data was used to train the models and the remaining 20% were used in the validation set. For each topic solution, I stored the coherence score C_V . This coherence score measures whether the words in a topic tend to co-occur together. To compute, pairs of top-ranked words in the topic

are examined. A score equal to the log of the probability that a document containing at least one instance of the higher-ranked word also contains at least one instance of the lower-ranked word is computed. The method then adds up a score for each distinct pair of top ranked words.

Therefore, it is analogous to prioritizing solutions with high loadings for measured variables that load onto a given factor in factor analysis. Larger values of coherence indicate better topic cohesiveness. The best-fitting of these models used an alpha value of 0.90999, a beta value of 0.90999, and 6 total topics, and attained a coherence score of 0.51. The researcher-assigned label for each of those topics, the 5 most-relevant terms within each topic, and the % of tokens that each topic accounts for are provided in the table below:

| Topic # | Label | Highest-Loading Terms | % of Tokens Accounted For |
|----------------|---------------------------------------|--|----------------------------------|
| 1 | Travel for Spring Break | Get, go, break, spring, work | 29.4% |
| 2 | Completing coursework | Stress, hour, class, assignment, time | 26% |
| 3 | Interpersonal responsibilities | Friend, meet, boyfriend, sorority, bad | 14.2% |
| 4 | Group dynamics in classes | Lab, worry, people, figure, question | 10.8% |
| 5 | Tardiness and/or absences | Class, late, yet, miss, hour | 10.2% |
| 6 | Physically attending responsibilities | Walk, first, catch, long, hard | 9.4% |

Interestingly, the most prevalent topic (accounting for 29.4% of tokens) contains the highest-loadings for terms such as “get,” “go,” “break,” “spring,” and “work.” This is a function of the time period, as surveys were completed in the weeks leading up to spring break at the

university at which data collection took place. Spring break, as a concept, could be stressful for a variety of reasons. Among the responses, as is evident in the highest-loading terms, participants cited their stress surrounding spring break as specifically dealing with things such as: planning for travel, spending time with people they weren't interested in spending time with, getting work done so that they didn't have to work over spring break, packing, arranging for transportation, and more. In that way, certain elements of workload stressors or interpersonal stressors made themselves evident in this larger context of spring break. This reinforces the prevalence of these types of stressors, which could theoretically be even more predominant if data were collected outside of the context of the impending break. The second most prevalent topic (accounting for 26% of tokens) contains the highest loadings for terms such as "stress," "hour," "class," "assignment," and "time." The third most prevalent topic (accounting for 14.2% of tokens) contains the highest loadings for terms such as "friend," "meet," "boyfriend," "sorority," and "bad." The fourth most prevalent topic (accounting for 10.8% of tokens) contains the highest loadings for terms such as "lab," "worry," "people," "figure," and "question." The fifth most prevalent topic (accounting for 10.2% of tokens) contains the highest loadings for terms such as "class," "late," "yet," "miss," and "hour." The sixth and final topic (accounting for 9.4% of tokens) contains the highest loadings for terms such as "walk," "first," "catch," "long," and "hard." Furthermore, the topics provided in this LDA output can be tracked back to each of the stressor categories alluded to in the classification groupings. Topics like "Completing coursework," "Tardiness and/or absences," and "Physically attending responsibilities" likely captured many workload-related stressors. Topics like "Interpersonal responsibilities" and "Group dynamics in classes" likely captured many interpersonal stressors. And again, the majority of stressors categorized in the "other" group were somehow related to preparation for

spring break, whether that consisted of packing, arranging transportation, or dealing with the exhaustion of travel more generally.

Discussion

Summary of Findings

The autoregressive and cross-lagged paths tested by the cross-lagged panel model specified and tested in this study suggest that positive affect at time point T is significantly impacted by positive affect, coping sequences that primarily consist of problem-focused coping, the presence of an interpersonal stressor, and the presence of a workload stressor, all at time point T-1. Specifically, the coefficients for positive affect and problem-focused coping sequences at time point T-1 are positive, suggesting that higher levels of positive affect and problem-focused coping may increase the prevalence or strength of positive affective states at the next time point. The coefficients for interpersonal and workload stressors at time point T-1 are negative, suggesting that the presence of either of these types of stressors may decrease the prevalence or strength of positive affective states at the next time point. The paths of this model also suggest that negative affect at time point T is significantly impacted only by negative affect at time point T-1. This coefficient is positive, suggesting that higher levels of negative affect at time point T-1 may increase the prevalence or strength of negative affective states at time point T.

Both of the moderation paths testing the moderating role of emotion-focused strategies in the presence of interpersonal stressors were found to be significant. The moderation coefficient on the relationship between interpersonal stressors and positive affect was negative, suggesting that emotion-focused coping may have a buffering effect on the tendency for interpersonal

stressors at time point T-1 to decrease positive affect at time point T. Due to this coefficient being statistically significant, support was lent to Hypothesis 1a. The moderation coefficient on the relationship between interpersonal stressors and negative affect was positive, suggesting that emotion-focused coping may intensify the relationship between interpersonal stressors at time point T-1 and negative affect at time point T. That cross-lagged coefficient, however, was weak and insignificant, which limits the practical utility of this finding. Additionally, because the same buffering effect observed in Hypothesis 1a was expected here and was not found, Hypothesis 1b was not supported.

The moderation paths testing the moderating role of problem-focused strategies in the presence of interpersonal stressors produced mixed results. The moderation coefficient on the relationship between interpersonal stressors at time point T-1 and positive affect at time point T was positive, suggesting that problem-focused coping strategies may amplify the negative impact of interpersonal stressors on positive affect at the next time point. Because this coefficient was statistically significant, support was lent to Hypothesis 2a. The moderation coefficient on the relationship between interpersonal stressors at time point T-1 and negative affect at time point T was negative, suggesting that problem-focused coping strategies may buffer the negative impact of interpersonal stressors on negative affect. Again, though, that cross-lagged coefficient was weak and insignificant. Furthermore, the moderation coefficient on this cross-lagged path was also insignificant and in the opposite direction of what was hypothesized. Therefore, Hypothesis 2b was not supported.

Neither the moderation paths testing the moderating role of emotion-focused strategies in the presence of workload stressors, nor the moderation paths testing the role of avoidant strategies in the presence of workload stressors produced significant results. Furthermore, the

only moderation coefficient from that grouping that was in the direction of what was hypothesized was that testing hypothesis 4b, that avoidant coping would intensify the impact of workload stressors on negative affect. Again, though, a small and insignificant cross-lagged coefficient paired with an insignificant moderation coefficient meant a lack of support for that hypothesis as well. Therefore, Hypotheses 3a, 3b, 4a, and 4b were all not supported.

Because there were more significant cross-lagged paths for positive affect at time T than negative affect at time T, the extent to which the moderator paths could have potentially provided support to the hypotheses was a bit limited. Even still, there was no situation in which an insignificant cross-lagged coefficient was the lone reason for a hypothesis not receiving adequate support. Additionally, the moderation coefficients involving workload stressor paths were by and large much smaller than those involving interpersonal stressor paths.

Limitations

Some of the limitations of this study arise from the choice to utilize an ecological momentary assessment (EMA) data collection approach. EMA, similar to other real-time data collection methods, can sometimes be burdensome for participants—this often leads to non-compliance in the form of incomplete data due to assessment timing being inconvenient or due to participants ignoring or simply forgetting about a survey. This limitation was prevalent in the sense that 10 of $N = 93$ participants (10.75%) were missing 20% of their data or more, which led to them being removed from the sample. Even then, enough missingness was present in the data that imputation was necessary in order to properly specify and test all model paths of interest. Efforts were made to mitigate the threat of this limitation in the form of survey completion flexibility as well as in the form of the in-person meetings that took place prior to EMA data collection. Regarding the former, participants were able to self-select into receiving surveys by

whichever mean was most convenient to them—be it text or email. Furthermore, participants were able to anticipate survey delivery since timing was consistent throughout the duration of the study and participants were made aware of this schedule prior to EMA data collection. Aside from this, the personal importance of the study was stressed during the entry survey Zoom meeting. In spite of these steps, missing data was obviously still present and likely impacted results and data quality.

Another issue with EMA data collection is that of recall bias. EMA relies on participants being able to self-report their experiences, thoughts, behaviors, and feelings in real-time. In some instances, participants may not be able to accurately recall or report these details, which could lead to distortions in the data. Efforts were made to mitigate the threat of this limitation by implementing three surveys per day spaced over a 10-hour period of time such that participants only had to reflect on a few recent hours rather than an entire day or even more extended period of time. Still, recall bias could have created data trends that aren't actually reflective of how participants felt or behaved.

Yet another data quality threat with EMA data collection is reactivity, as participants may modify or falsely report their behavior or experiences due to awareness of the fact that they are being monitored. This could stem from the desire to conform to social expectations and withhold information that isn't deemed socially desirable. The anonymity of the data collection approach would hopefully mitigate the threat of this limitation, but biased or artificial data could have persisted nonetheless.

Another common series of issues related to EMA data collection are technological issues. Regardless of whether participants opted into survey completion via email or text, reliance on electronic devices could present issues related to battery life, Wi-Fi connectivity, or device

malfunction in general. However, the consistent scheduling of survey delivery and known mode of delivery would hopefully help participants prepare for the reception and completion of surveys for any given day. Even still, the quality and completeness of the data could have been impacted, introducing measurement errors.

The final consideration of EMA data collection limitations is limited data depth. Because of the aforementioned issues with data missingness or incompleteness, the surveys employed needed to be fairly brief. Because of this brevity, and because of the frequency of assessment, data needed to be collected on relatively narrow domains of interest. As such, the breadth and depth of the collected data was limited—as a result, certain nuances or complexities of the hypothesize relationships may not have been adequately captured. In spite of all of these limitations, EMA is a valuable approach for studying real-world experiences and remains a good choice to investigate the relationships of interest in the present study.

There are additional limitations of the present study due to the selection of multilevel structural equation modeling (MSEM) as an analytic approach. One of the most well-known limitations of MSEM approaches is that they make assumptions of normality. MSEM approaches assume normally distributed observed and latent variables—any violations of this assumption can impact the accuracy of parameter estimates and standard errors.

Another common issue with MSEM approaches are related to sample size requirements. As a general rule, MSEM requires a sufficiently large sample size in order to obtain parameter estimates that are reliable and standard errors that are accurate. Issues with small sample sizes are compounded by the specification of a complex model. When the paths in question involve multiple variables, as is the case for analyses in the present study, specification problems related to an inability to uniquely estimate parameter estimates may persist. These threats involve non-

convergence and model misspecification and can impact the conclusions that can be drawn from the results of path analysis.

Sticking with the idea of complexity, MSEM is capable of estimating incredibly complex models. While this is useful and makes MSEM a good choice when the relationships of interest are not necessarily straightforward, it can also present computational challenges related to the requisite calculations and limit options with regard to statistical software and computational resources. In extreme cases, these computational challenges can present issues related to convergence problems and slow and/or tedious computation. These issues can affect the reliability and efficiency of parameter estimates.

Finally, MSEM approaches are context-specific (i.e., findings may not generalize to other populations or settings). Models are based on the specific structure of the data, particularly with regard to the way in which they are nested. As such, these models aren't necessarily applicable to other nested structures or contexts outside of the college undergraduate experience of workload and interpersonal stressors. This, of course, limits the generalizability of these findings with regard to the direction of coefficients, their magnitude, and their significance. In spite of these limitations, MSEM approaches to data analysis, model specification, and model testing are powerful tools for analyzing data that have a nested structure.

The final few limitations deal with the design and protocol specifically attributable to the present study. Firstly, the sample collected for this study is predominantly female, predominantly white, and consists entirely of college undergraduate students. Again, this means that the relationships represented in the findings here may not translate to other contexts or populations. More specifically, these sample features (particularly college undergraduate status) may impact not only the frequency with which participants encountered interpersonal, workload, or "other"

stressors, but also the frequency and intensity with which they engaged in particular coping strategies.

Second, the EMA-phase surveying times of 9am, 2pm, and 7pm were selected on the basis of times that would be most representative of a person's day and, therefore, most insightful. However, these times could practically have been very different in meaning from participant to participant. For instance, some participants could have just woken up at 9am. Others could have been a couple of hours into a shift at a part time job they hold. No considerations related to the day-to-day schedule of the participants (e.g., when they typically wake up, when they typically go to sleep, etc.) were made. This surveying time uniformity could have certainly impacted both the type of stressors that participants reported and the coping strategies that they felt equipped to utilize at any given time.

As a final consideration, the present study utilizes only a within-person design. That is, sequences of coping strategies are examined over time as they occur and for the impact that they have within each participant's life. This design does not take into account between-person differences that could significantly impact the outcomes of interest, such as self-efficacy and grit. This, coupled with the fact that both stressors and coping strategies are measured for their type rather than the specific strategy engaged in, makes it difficult to establish a 1-to-1 for coping strategy to stressor. As such, the interpretation of the results is limited to within-person differences that occur on the basis of categorical status.

Future Directions

The present study faced several challenges, but there are many directions in which this line of research could be taken that would potentially address those challenges or otherwise

provide additional information surrounding the relationships studied here. The first such potential direction is to simply collect additional data to incorporate into the testing of the present pathways and the resulting models. Though a sample of $N = 93$ was collected ($N = 83$ after controlling for large percentages of missingness) and that was in line with the objectives of the study, the presence of missing data coupled with the complexity of the model presented issues. The collection of more participants (especially participants with little to no missing data in their responses) would certainly help address concerns that may arise as a result of model complexity. Furthermore, a larger sample would also hopefully increase the presence of interpersonal stressors that could be analyzed. Though I was able to collect 191 reports of interpersonal stressors, that was less than one-quarter the number of workload stressors that were reported.

An additional future direction would be to implement a similar design with a non-student population. Students are a good population for stress research in the sense that students deal with multiple stressors from various parts of their lives and of varying degrees of severity every day – this is likely the result of balancing schoolwork, home life, new friendships and social circles, new responsibilities, and potentially a job as well. Even still, it would be interesting to examine the extent to which the findings of the present study could generalize to a population that has different sources of stress, more or fewer resources to deal with that stress, and/or a population that has more experience with coping with stress, in general. Such a study could potentially provide insight into how coping flexibility as a phenomenon changes or remains the same as individuals become older and have more experiences from which they can draw.

Another potential future direction for this research would be to shift the way that the stressors experienced by participants are examined. This could be approached from a

measurement approach perspective or from a classification perspective. For instance, researchers could take a deeper dive into interpersonal stressors to see if coping strategy effectiveness differs for different types of interpersonal stressors (conflicts with coworkers, conflicts with romantic partners, etc.). On the other hand, researchers could measure stress by some means other than open-ended text response from participants and classification by the researcher. Such a study could potentially reveal some detail or factor within the stressors themselves that impact these relationships and how coping dynamically unfolds over time.

Keeping in line with shifting the lens with which the constructs in question are measured or observed, future studies could look into other means of measuring coping effectiveness. Though positive affect and negative affect are commonly studied for their relationship to coping, they are not the end-all be-all. Coping as a process is sufficiently complex that other constructs or considerations could potentially offer insight into whether or not one would consider an individual to have “successfully” coped. For instance, feeling positive on the whole at the time of measurement may not necessarily reflect outcomes that are waiting further downstream – one may feel good about engaging in avoidant coping by watching a movie instead of studying for an exam, but that positive feeling won’t necessarily hold once exam time rolls around. In fact, one may argue that the nature of the outcome once the stressor has come to a resolution is more important than how we feel about it.

Another future direction to consider is the potential to track specific stressors over time rather than having participants reflect on all of the stress that they are experiencing in their lives. Any given participant, for instance, could have reported on a different stressor at time T than they did at time T-1, and the same could be said for all subsequent time points. In fact, that was the case for many participants in the present study – the presence of a specific stressor was often

limited to being mentioned by the participant experiencing it at a maximum of three times. It would be interesting to have participants select a stressor at the outset of EMA data collection that they knew would be persistent and reflect on that same stressor for each survey. Such a design would allow researchers to feel more confident that they were tracking the impact of the same stressor from beginning to end. It is important to note, however, that this would still not be causal – outcomes such as positive and negative affect could still be impacted by stressors other than the “primary” stressor or some other external factors.

One final future direction could simply consist of collecting the requisite data for this analytic approach among a student population at some point in time other than prior to spring break or some other large break. From the stressors that were cited by participants (seen both in the process of coding those stressors and in the results of the LDA), it was quite obvious that spring break had a large role to play in participant experience of stress. Even if the stressor itself wasn't about spring break, its severity could have been exacerbated or mitigated by the presence of spring break. As such, it would be interesting to see if similar relationships would be found were data collected during a different period of time.

Conclusion

The present study examined the factors at time point T-1 that could potentially impact positive affect and negative affect at the adjacent time point T. Autoregressive paths for positive and negative affect, cross-lagged paths for positive affect, negative affect, interpersonal stressor presence, workload stressor presence, emotion-focused coping, problem-focused coping, and avoidant coping, and moderation paths examining the impact of coping strategy on the relationship between stressor presence and positive and negative affect were all examined. Positive affect at time point T was significantly impacted by positive affect, problem-focused

coping, the presence of an interpersonal stressor, and the presence of a workload stressor at time point T-1. Negative affect at time point T, on the other hand, was only significantly impacted by negative affect at time point T-1. Additionally, there were a couple of significant moderating effects found for the experience of interpersonal stressors. Specifically, the primary use of emotion-focused coping in response to an interpersonal stressor at time point T-1 buffered the negative impact of that stressor on positive affect. The primary use of problem-focused coping in response to an interpersonal stressor at time point T-1, on the other hand, amplified the negative impact of that stressor on positive affect.

This study provides some support for the idea that the type of coping strategies that you engage in can affect how a stressor impacts positive affect. This effect can be seen at a subsequent time point from when the stressor initially occurred. Furthermore, this effect is not statistically significant when considering outcomes relevant to negative affect or to stressors other than those which are interpersonal in nature. More research is therefore needed to better understand the complexities that underly these relationships. Specifically, future studies should consider collecting a sample size that is both larger and contains data with low percentages of missingness, especially if the complexity of the models tested are comparable to the current one. Additionally, future studies should consider examining non-student populations, investigating other operationalizations of the constructs in question (or even different constructs entirely in the case of coping effectiveness), and/or investigating long-term, persistent individual stressors. Any of the above considerations would likely yield information that aids in our understanding of the extent to which these relationships are truly supported.

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Table 1

Correlation Matrix

| | Positive Affect | Negative Affect | Problem- focused Coping | Emotion- focused Coping | Avoidant Coping | Trait- level Positive Affect | Trait- level Negative Affect |
|-----------------------------------|--------------------|--------------------|-------------------------------|-------------------------------|--------------------|---------------------------------------|---------------------------------------|
| Positive Affect | - | 0.28 | 0.64 | 0.43 | 0.29 | 0.32 | -0.05 |
| Negative Affect | - | - | 0.30 | 0.42 | 0.47 | -0.22 | 0.44 |
| Problem- focused Coping | - | - | - | 0.58 | 0.26 | 0.20 | -0.14 |
| Emotion- focused Coping | - | - | - | - | 0.59 | 0.03 | 0.06 |
| Avoidant Coping | - | - | - | - | - | 0.00 | -0.01 |
| Trait-level Positive Affect | - | - | - | - | - | - | -0.12 |
| Trait-level Negative Affect | - | - | - | - | - | - | - |

Table 2

| <i>Covariances</i> | | | |
|---|----------|----------------|---------|
| | Estimate | Standard Error | p-value |
| Positive Affect and Negative Affect | 0.094 | 0.049 | 0.055 |
| Positive Affect and Problem-focused Coping | 0.073 | 0.044 | 0.100 |
| Positive Affect and Emotion-focused Coping | 0.031 | 0.018 | 0.090 |
| Positive Affect and Avoidant Coping | 0.016 | 0.021 | 0.458 |
| Negative Affect and Problem-focused Coping | 0.077* | 0.038 | 0.039 |
| Negative Affect and Emotion-focused Coping | 0.077** | 0.027 | 0.004 |
| Negative Affect and Avoidant Coping | 0.108* | 0.052 | 0.037 |
| Problem-focused Coping and Emotion-focused Coping | 0.034 | 0.025 | 0.163 |
| Problem-focused Coping and Avoidant Coping | 0.016 | 0.021 | 0.452 |
| Emotion-focused Coping and Avoidant Coping | 0.051* | 0.023 | 0.031 |

Note. * $p < 0.05$ ** $p < 0.01$

The Three-Factor Model of Coping

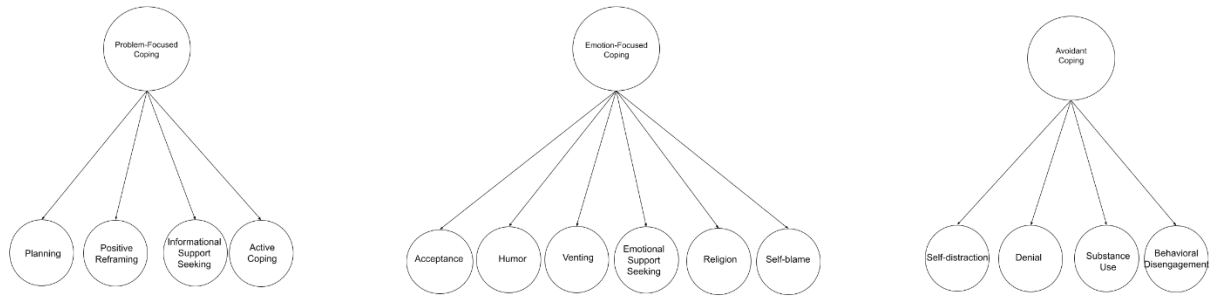


Figure 1. Three-factor Model of Coping with facets.

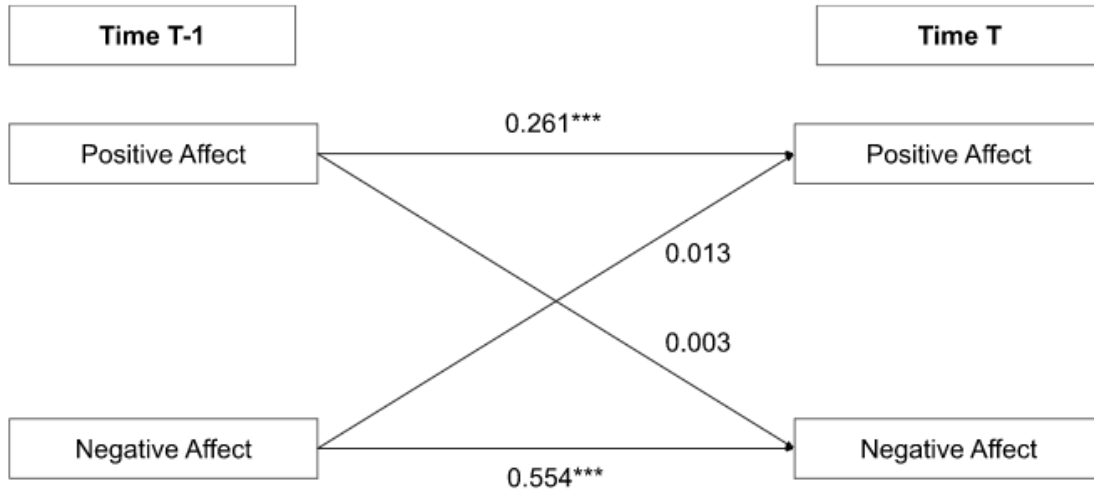


Figure 2. Autoregressive paths and cross-lagged paths for positive affect and negative affect.

*** $p < 0.001$.

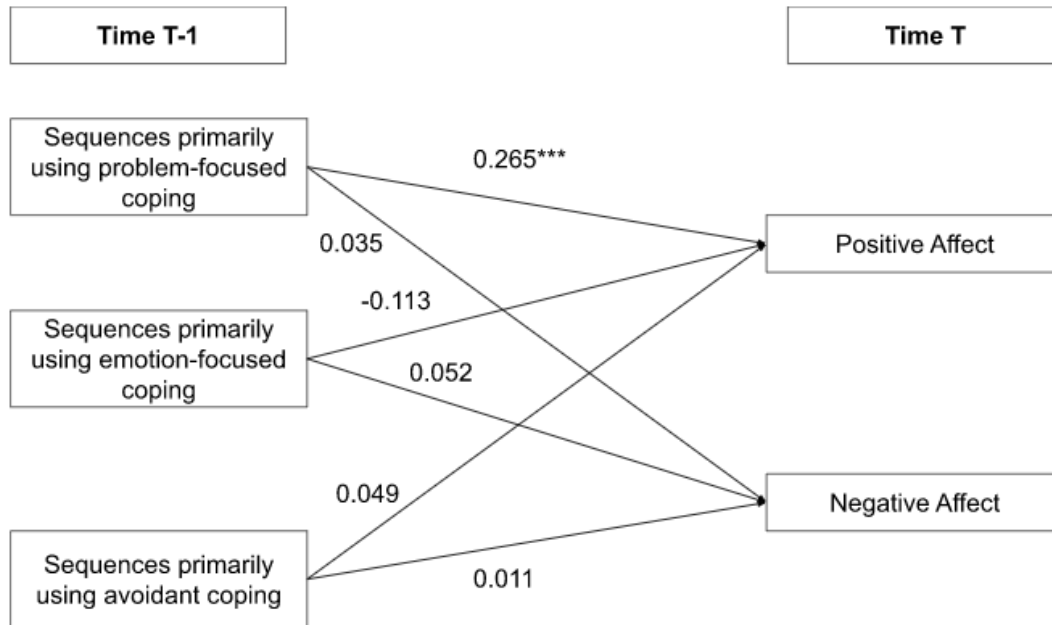


Figure 3. Cross-lagged paths between coping sequences that are primarily problem-focused, emotion-focused, and avoidant and positive and negative affect. *** $p < 0.001$.

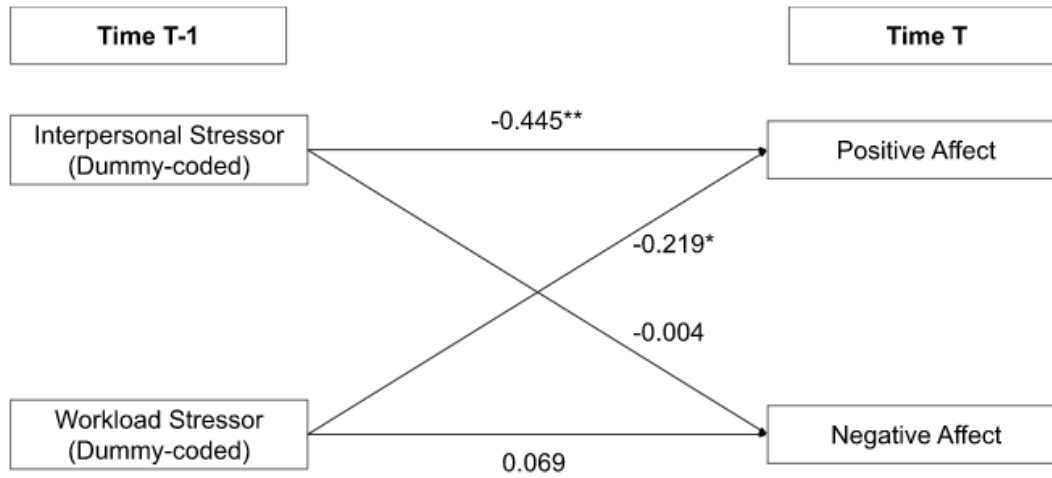


Figure 4. Cross-lagged paths between dummy-coded interpersonal stressors and workload stressors and positive and negative affect. * $p < 0.05$ ** $p < 0.01$.

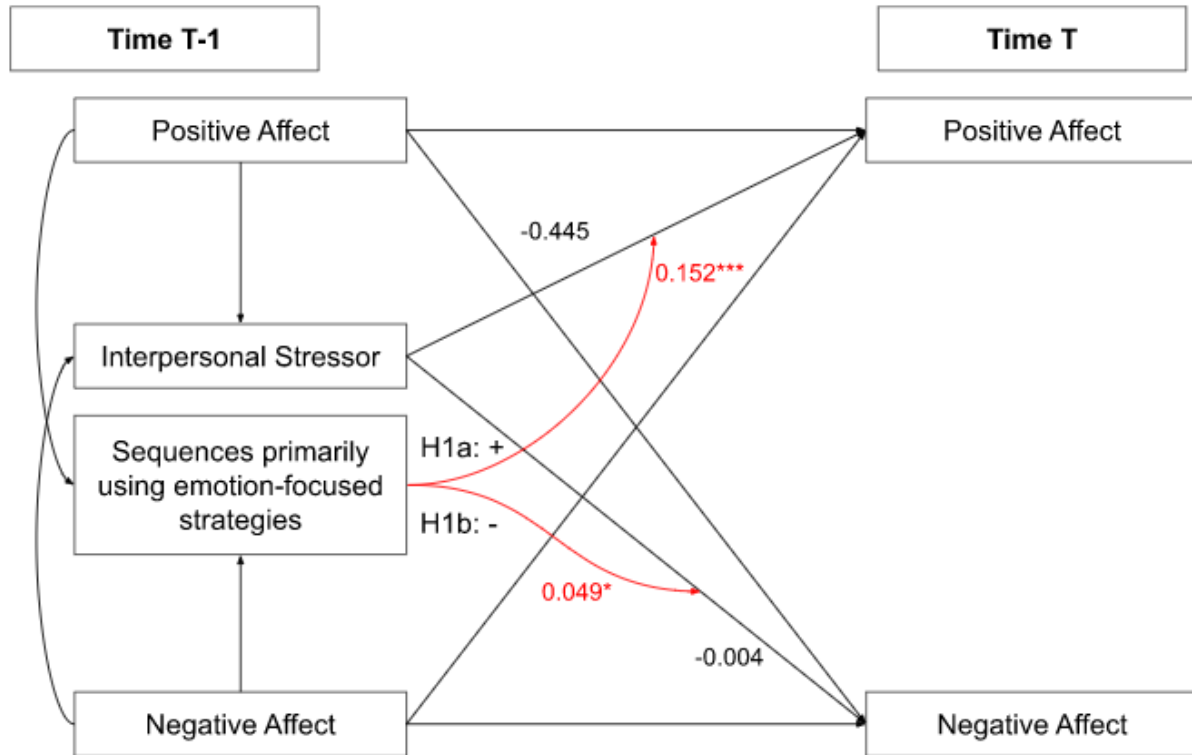


Figure 5. Moderation paths testing the moderating effect of sequences primarily using emotion-focused coping on the relationship between interpersonal stressors and positive and negative affect. * $p < 0.05$ *** $p < 0.001$.

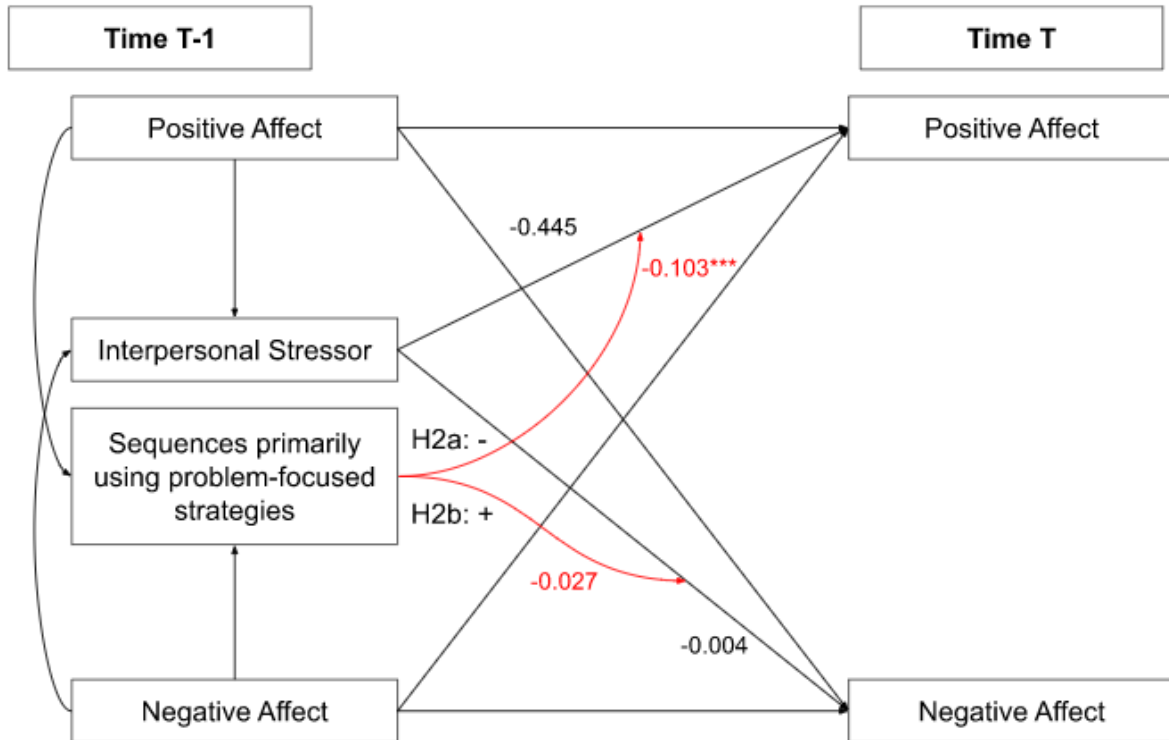


Figure 6. Moderation paths testing the moderating effect of sequences primarily using problem-focused coping on the relationship between interpersonal stressors and positive and negative affect. *** $p < 0.001$.

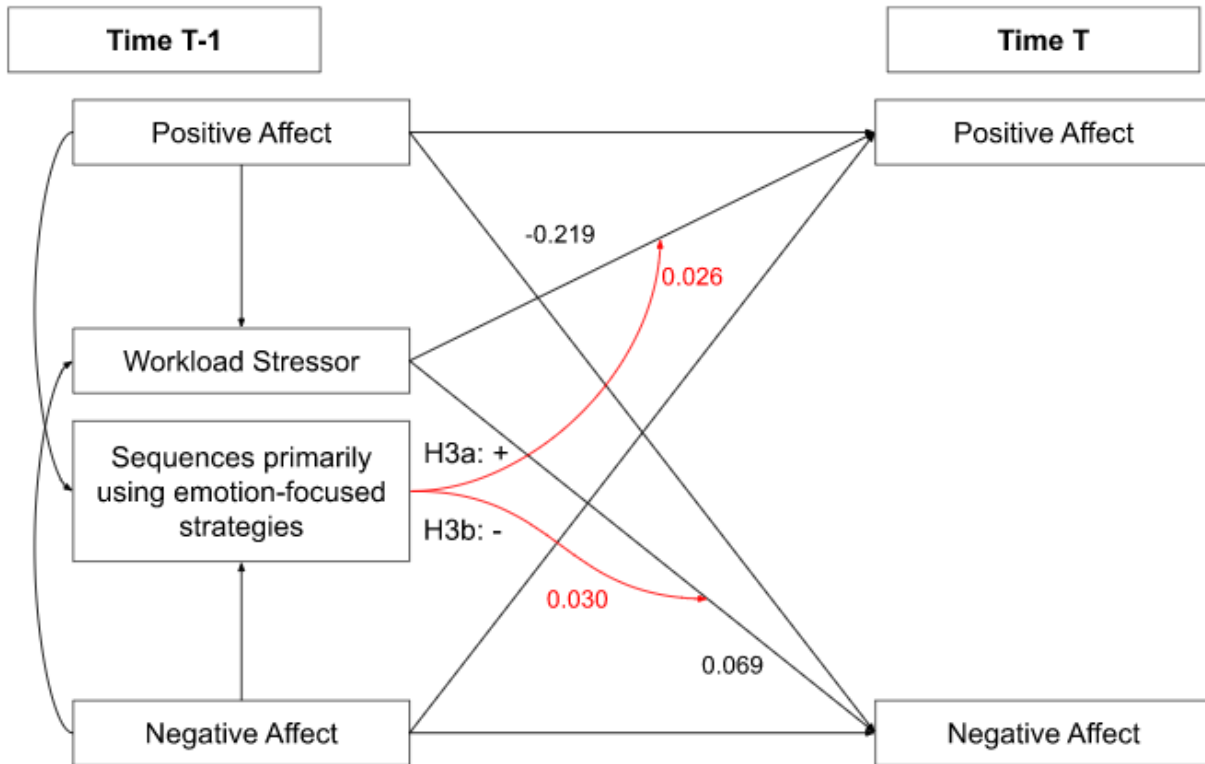


Figure 7. Moderation paths testing the moderating effect of sequences primarily using emotion-focused coping on the relationship between workload stressors and positive and negative affect.

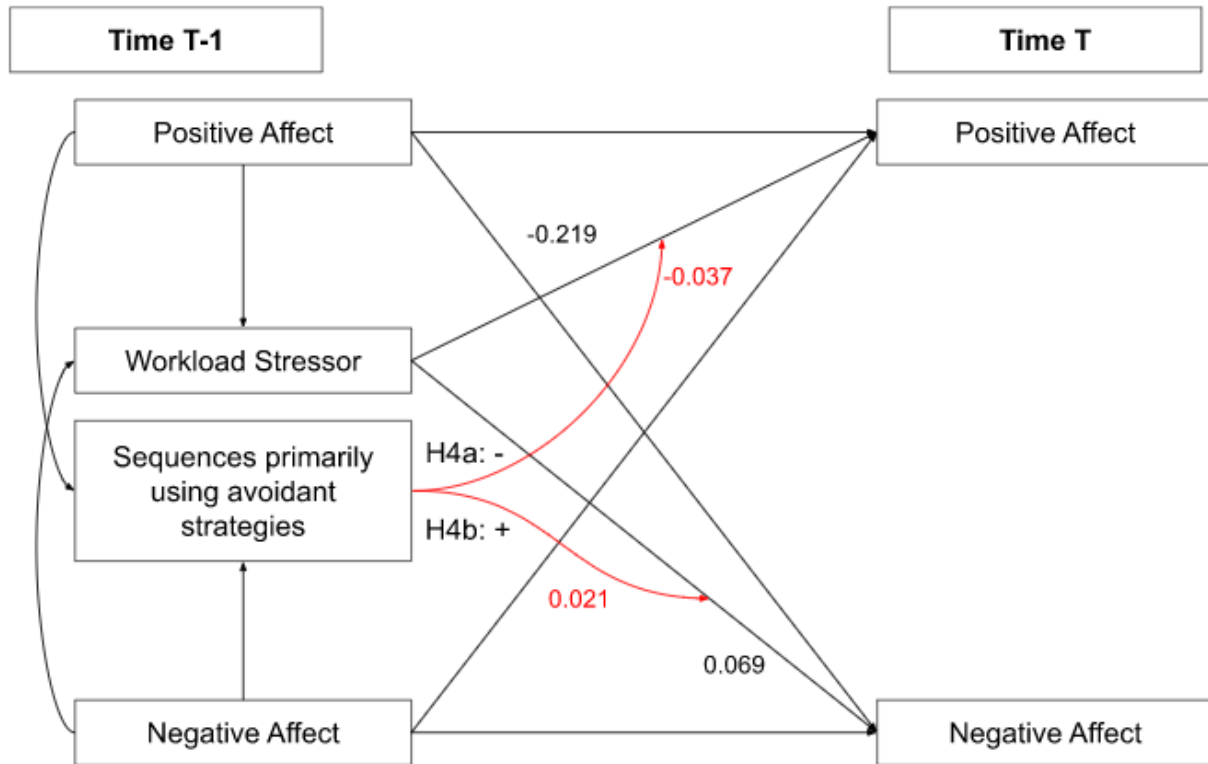


Figure 8. Moderation paths testing the moderating effect of sequences primarily using avoidant coping on the relationship between workload stressors and positive and negative affect.

Appendix A: Trait-Level Self-Esteem Item

Please describe your **general** feelings about your own personal value and self-worth in your day-to-day life. Please be detailed:

[TEXT BOX]

Appendix B: Demographics Survey

1. Please enter your current age: [TEXT BOX]
2. Please select your ethnicity:
 - Hispanic or Latinx
 - Not Hispanic or Latinx
 - Prefer not to say
3. Please select your race(s):
 - White/Caucasian
 - Black/African American
 - Asian
 - Native American
 - Native Hawaiian/Pacific Islander
 - Other
 - Prefer not to say
4. Please select your sex:
 - Male
 - Female
 - Other
 - Prefer not to say

Appendix C: Primary Stressor Item

Please describe the task or event that has caused you the **most** stress over the last several hours.

Please be detailed:

[TEXT BOX]

Appendix D: Brief COPE Subscales

| Item | Coping Facet | I haven't been doing this at all | I've been doing this a little bit | I've been doing this a medium amount | I've been doing this a lot |
|---|---|----------------------------------|-----------------------------------|--------------------------------------|----------------------------|
| I've been concentrating my efforts on doing something about the situation I'm in | Active Coping | [] | [] | [] | [] |
| I've been taking action to try to make the situation better | Active Coping | [] | [] | [] | [] |
| I've been getting help and advice from other people | Instrumental/Informational Social Support | [] | [] | [] | [] |
| I've been trying to get advice or help from other people about what to do | Instrumental/Informational Social Support | [] | [] | [] | [] |
| I've been trying to come up with a strategy about what to do | Planning | [] | [] | [] | [] |
| I've been thinking hard about what steps to take | Planning | [] | [] | [] | [] |
| I've been accepting the reality of the fact that it has happened | Acceptance | [] | [] | [] | [] |
| I've been learning to live with it | Acceptance | [] | [] | [] | [] |
| I've been getting emotional support from others | Emotional Social Support | [] | [] | [] | [] |
| I've been getting comfort and understanding from someone | Emotional Social Support | [] | [] | [] | [] |
| I've been making jokes about it | Humor | [] | [] | [] | [] |
| I've been making fun of the situation | Humor | [] | [] | [] | [] |
| I've been saying to myself "this isn't real" | Denial | [] | [] | [] | [] |
| I've been refusing to believe that it has happened | Denial | [] | [] | [] | [] |
| I've been turning to work or other activities to take my mind off things | Self-Distraction | [] | [] | [] | [] |
| I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping | Self-Distraction | [] | [] | [] | [] |
| I've been giving up trying to deal with it | Behavioral Disengagement | [] | [] | [] | [] |
| I've been giving up the attempt to cope | Behavioral Disengagement | [] | [] | [] | [] |

Appendix E: Positive and Negative Affect Schedule Items

| Indicate the extent to which you have felt this way over the last several hours | | Very slightly or not at all | A little | Moderately | Quite a bit | Extremely |
|---|------------|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| PANAS 1 | Active | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PANAS 2 | Determined | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PANAS 3 | Attentive | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PANAS 4 | Afraid | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PANAS 5 | Nervous | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PANAS 6 | Upset | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |