

TIME PRESSURE AND STRESS

Why is Time Pressure Stressful? The Role of Attention, Demands, and Resources

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Abstract

While it is evident that time pressure leads to increases in stress, less is known about the mechanisms underlying the effects of time pressure. The current set of studies sought to address this gap using an experimental paradigm. Study 1 focused on the link between urgency messaging and subjective stress. Study 2 focused on identifying the factors underlying this relationship. In Study 1 and 2, we manipulated time pressure via urgency messaging. In Study 2, we manipulated attentional focus by instructing participants to attend to a countdown timer or the destination marker in a computerized route planning and tracing task. Using the integrative framework of stress, attention, and visuomotor performance as a guiding framework, we tested whether responses to time pressure resembled the threat response described by this integrative framework which emerges due to a mismatch between situational demands and personal resources to cope. We used self-report ratings of stress (as a proxy for threat) and determination (as a proxy for challenge), in addition to ratings of demand and preparedness (as proxies for demand and resource evaluations). Results of Study 1 and 2 replicated the existing link between urgency and stress. Furthermore, in Study 2, we found that directing attention to a representation of time pressure resulted in a perceived increase in demands and stress and a decrease in resources. This suggests that negative responses to time pressure may be eliciting a threat response.

Note: The use of “we” in this thesis reflects the collaborative nature of this research.

Keywords: time, pressure, stress, threat, attention, urgency

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Why is Time Pressure Stressful?

The Role of Attention, Demands, and Resources

Imagine you are waking up on your day off. You're able to get up when you're feeling sufficiently rested and have a cup of tea. As the day progresses, you think to yourself, *What should I do with all of this free time?* You decide to run some errands and that you'll meet some friends for dinner later. Fast forward to the afternoon; you see what time it is and think *Oh no, I've still got so much to do, but I must get home soon to get ready for dinner!* You go over your list again and again in your head. It's getting difficult to focus, all you can think about is the time it will take to get things done and whether you'll have the ability to complete your list. You start to feel stressed and overwhelmed. You can't help but check the clock and you struggle to decide which task to do next.

Time pressure emerges from the belief that there is insufficient time to complete a task. Time pressure that is self-generated is called perceived time pressure (PTP; Sussman & Sekuler, 2022; Zakay, 1990), in contrast to objective time pressure, which occurs when there is a true deadline enforced by a clock or calendar date (Sussman & Sekuler, 2022). One method used to induce objective time pressure is by imposing time constraints. This typically involves calculating the time it takes to complete a task and allotting less time than is typically required. Some researchers employ variable time constraints where there is either more or less global time to complete the task (Brunye et al., 2017) or altering the time between successive trials in intertrial intervals (ITI; Sussman & Sekuler) to be longer or shorter.

Among the myriads of methods used to induce time pressure, most researchers find that time pressure tends to result in increases in stress (Plonski et al., 2025) and negative affect (Sussman & Sekuler, 2022). Furthermore, some studies have shown that time pressure alters the

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way that humans process information and form judgments (Rice & Trafimow, 2012; Mann & Tann, 1993) and the strategies employed when navigating spatial contexts (Brunye et al., 2017). Indeed, one study found that less time to complete a task resulted in cognitive strategies employed to facilitate performance under time pressure. For instance, Brunye et al. (2017) conducted a study that examined the effect of time pressure on goal-directed wayfinding in which participants were instructed to locate 20 landmarks in a virtual urban environment. The task was broken down into two-phase trials, the first of which was used to learn the environment and the task, while the second was used to examine how navigation behavior changed given time constraints. Time pressure conditions included three levels of time pressure (high, medium, and low distinguished by percentiles). Higher time constraints were associated with a shift in cognitive strategy in which participants chose familiar routes (use of more readily available, heuristic processing) over potential shortcuts that required additional cognitive effort (Brunye et al., 2017). This finding was consistent with other works which observed changes in cognitive inhibition.

Indeed, Sussman and Sekuler (2022) examined the effects of time pressure on cognitive inhibition using the Eriksen Flanker task in addition to measures of psychological stress and negative affect. Time pressure was induced using ITI to manipulate the amount of time between trials to be shorter or longer, while preserving the global pacing of the task (Sussman & Sekuler, 2022). Findings indicated that less time between trials led to higher perceived time pressure, negative affect, and diminished cognitive inhibition (Sussman & Sekuler, 2022). The impact of time pressure can vary according to the method used. It is typical for studies to employ a single form of time pressure to examine its effects. Although, when comparing multiple methods of inducing time pressure, how might one find which is most effective?

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One such study examined the effects of time pressure by varying the form of time pressure used. Indeed, Plonski et al. (2025) manipulated time pressure using global time constraints (25 vs 35 minutes), waiting periods (20s, 30s, 50s), and urgency messaging (verbally instructions to hurry up). Urgency messaging was the only method that resulted in increases in subjective stress compared to the other methods attempted. What is it about the belief in less time that bears such a strong effect on cognition and behavior?

Psychological Stress

According to the Transactional Model of Stress and Coping (Lazarus, 1966), subjective stress is the result of a perceived inability to cope. According to this perspective, entering a stressful situation triggers a dual-level appraisal process in which an individual appraises what is at stake in the situation and whether they are equipped with any personal resources to prevent harm from the stressor and maximize gain from overcoming the stressor (Lazarus, 1966). It may be that urgency messages trigger a similar appraisal process.

The Biopsychosocial Model (BPSM; Blascovich, 2008) integrates the appraisal process and physiological responses to the perception of an inability to cope as responses of challenge and threat (CAT) which are associated with fitness or weakness in overcoming a stressful situation (Blascovich, 2008). Likened to the survival aspect of the stress response, physiological responses (i.e., toughness and weakness) are determined by whether resources are matched to the demands of a situation. If one has the necessary skills and cognitive resources (i.e., attentional capacity) to perform in a situation, this results in a state of challenge, whereas the lack of these necessary resources results in a state of threat (Blascovich, 2008). Physiological responses of challenge are characterized by increased cardiac output and lower peripheral resistance to allow the circulatory system to deliver blood and oxygen to the active tissues. In contrast, responses of

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threat are characterized by vasoconstriction and increased peripheral resistance, thereby reducing blood flow and vascular resistance (Blascovich, 2008).

Integrative Framework

The Integrative Framework of Stress, Attention, and Visuomotor Performance (IFS; Vine et al., 2016) incorporates relations expressed in earlier models and expands on these processes by positing a mechanistic explanation for how stress responses unfold during a visuomotor task. The IFS extends prior models by positing interactions between stress and underlying cognitive processes necessary to perform (see Figure 1).

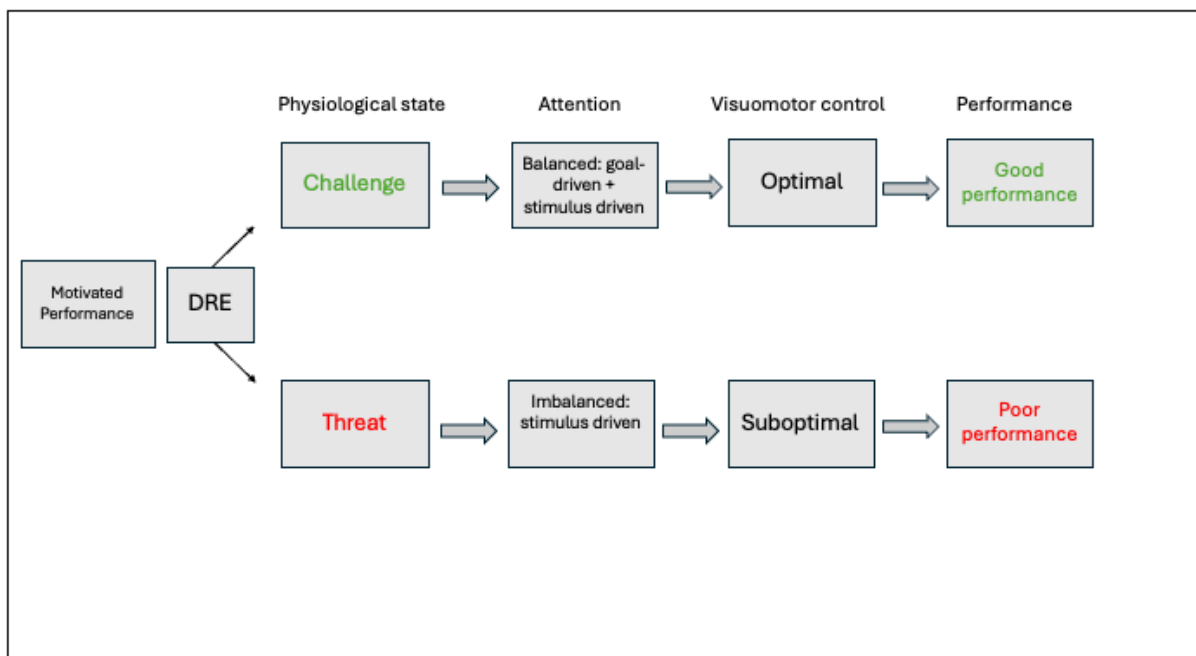


Figure 1. Note: The motivated performance triggers the Demand and Resource evaluation stage (DRE). Following the evaluation stage, responses to stress unfold along a continuum of challenge and threat.

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This framework conceptualizes basic processes underlying subjective responses to stress following an appraisal of a stressful situation. The stress response first triggers a demand and resource evaluation phase where an individual consciously and subconsciously evaluates the demands of a situation and the resources they possess to overcome the situation. If one believes they have sufficient resources to cope with the stressor, they enter a challenged state. However, if the demands of the situation lead to stress due to a lack of resources, they enter a state of threat. The response to a situation impacts attentional processes. Following an evaluation of challenge, attentional systems are balanced, such that selective attention is processing stimuli in accordance with one's goal and guides the visuomotor system to extract the necessary information from the environment to perform successfully.

During a state of challenge, attentional resources are balanced between goal-driven systems and stimulus-driven systems (Vine et al., 2016; Brimmell et al., 2019). For example, when measuring responses of challenge and threat via DRE, Brimmell and colleagues found that challenge states were associated with better accuracy, longer fixation durations, and lower search rates during performance (Brimmell et al., 2019). Conversely, attentional systems following a state of threat are imbalanced, such that attentional processes prioritize processing input from the environment to the detriment of one's goal (Vine et al., 2016). For example, Giancamilli et al. (2022) examined performance in an athletic context, specifically a free throw task in basketball. They were specifically investigating the Quiet Eye phenomenon (QE), a perceptual-cognitive skill enabling attentional control, during an induction of time pressure (Giancamilli et al., 2022). Giancamilli et al. (2022) found that less time available to aim and shoot the ball led to an inability to maintain QE and decreased performance accuracy (Giancamilli et al., 2022).

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The IFS implies that a state of threat places higher priority on processing threatening stimuli, in contrast to attentional processes following a challenged state. Responses of threat described by the IFS bear similarities regarding responses to time pressure in the literature with respect to the salience of threatening stimuli. Specifically, the tendency to fixate on time pressure has been shown to have negative effects on cognition resulting from negative responses to stress.

Through the IFS lens, increases in stress emerge due to an inability to cope with situational demands of a situation. In a similar vein, imposing time constraints has been shown to increase negative affect and stress. While each of these dynamics has been explored in isolation, there is no existing empirical work that integrates increases in stress with an explanation relating to the perception of situational demands and stress. This is the gap the current work sought to address.

The Current Studies

While the IFS was designed to portray a response to stress during a motivated performance situation, it is possible that the increases in subjective stress observed in response to time pressure are mirroring the response when triggered into a state of threat. Specifically, imposing a time constraint may trigger a perceived increase in demands and a decrease in resources, resulting in the perception of insufficient time which impacts processes (attention, visuomotor control) that are necessary to successfully complete the task at hand.

The current patterns in the literature enable us to presume a few key points. First, we can note that time pressure generates increases in subjective stress (Brunye et al., 2017; Sussman & Sekuler, 2022; Plonski et al., 2025) and that responses to stressors are highly influenced by the belief in an ability to cope, which is contingent upon the perceived demands and resources in a given situation (Lazarus, 1966; Blascovich, 2008). However, what is missing from this

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understanding is the reason for the increases in stress under time pressure. The current set of studies seeks to integrate the literature of subjective stress with the findings of time pressure to answer this question. Specifically, we believe that the IFS framework provides a way to empirically test whether increases in subjective stress are emerging due to a perceived increase in demands and/or a decrease in resources imposed by a sense of urgency. To test this hypothesis, the current set of studies has two aims.

In Study 1, we sought to verify the relationship between time pressure and stress. This allowed us to contribute to the small body of work examining perceived time pressure induced by urgency messaging. Once we verified increases in stress, we sought to understand why we observed this occurrence. In Study 2, we sought to unveil the mechanisms of stress underlying time pressure by manipulating time pressure in a similar fashion to Study 1 and introducing a manipulation of attentional focus. As suggested in the IFS, attentional systems play a central role in performance by guiding visuomotor control. We tested whether directing attention to relevant or irrelevant stimuli in alignment with goal-driven and stimulus driven systems had any impact on the subjective states. To examine this relation, we also measured ratings of stress (as a proxy for threat), determination (as a proxy for challenge), demand (as a proxy for demands), and preparedness (as a proxy for resources).

Study 1

Prior work has demonstrated a link between time pressure and subjective stress. Specifically, less time to complete a task is likely to induce negative affect (Sussman & Sekuler, 2022) and imposed urgency is shown to increase subjective stress (Plonski et al., 2025). When examining the effects of time pressure on stress, Plonski et al. (2025) examined the effects of time constraints, waiting periods, and urgency messaging. Results indicated that only urgency

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messaging was an effective elicitor of subjective stress. The purpose of Study 1 was to replicate the urgency messaging finding using a variant of the route planning and tracing task (RPT) used by Plonski et al. (2025).

During the RPT, urgency messaging was manipulated within-subjects across multiple trials. Approximately half of the trials were cued with urgency messaging either imposing a state of urgency: “Urgent, Hurry Up!!!”, or suppressing a need for urgency: “Not Urgent” messages. On all trials, participants were directed to plan and then trace routes on two dimensional maps using only a mouse or trackpad. Participants planned and traced routes on static 2D maps extracted from Google maps to replicate route planning in urban environments. Each map included an origin point, a destination, and occasional waypoints in between. Once participants completed a trial, they reported subjective stress for that particular trial. Similar to Plonski et al. (2025), we hypothesized that urgency messaging would yield increases in subjective stress compared to not-urgent messaging.

Method

Study 1 was conducted entirely online via Prolific, an online recruitment service. Surveys and demographic information were recorded using Qualtrics, and the route planning and tracing task (RPT) was hosted on Pavlovia.

Participants

We recruited a total sample of 100 participants (99 completed the task). Participants were compensated \$12 USD to complete the study. We excluded participants who were under the age of 18, did not reside in the US at the time of participation, or had participated in a study that featured the RPT before. We excluded participants if they had five or more trials in which they took more than 60s to plan or if they did not adhere to instructions (i.e., missed waypoints, did

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not follow marked paths). After exclusions, we had a total of $n = 93$ participants. A sample of this size gave us 80% power to detect a standardized effect size as small as $d = 0.29$.

Design

This study used a within-subjects experimental design. The independent variable was the manipulation of urgency, including urgent and nonurgent trials randomly assigned throughout the task. The dependent variable was the self-report ratings of subjective stress measured using a visual analogue scale at the end of each trial.

Materials

Route Planning Task. The route planning task (RPT) is a 15-minute computerized task programmed in PsychoPy that uses static maps of various regions across the U.S. to examine route planning under temporal pressure. Participants were tasked with planning a route from an origin point (indicated by the yellow star in Figure 2) to their destination (indicated by the red stop sign in Figure 2). Some maps included waypoints (indicated by the purple triangle in Figure 2) which must be factored into the planned route.

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At the beginning of the task, participants received instructions detailing various elements within the RPT (e.g., the starting point, the endpoint, and waypoints). Each trial consists of a planning phase, followed by a tracing phase. During the planning phase, participants plan a route from the origin to the destination. If there are any waypoints, the planned route must pass

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through the waypoints before ending at the destination. After they plan their route, they click 's' to start tracing. Participants received instructions to complete as many maps as possible without making tracing errors. Before proceeding to plan and trace routes, participants were given the opportunity to practice the task to get acquainted with the objective and motor demands. After the practice maps, participants proceeded to the actual task. The entire task proceeds at the pace of the participant. They decide when to initiate the tracing phase and can press 'f' when finished. Following the 'f' key press, participants click through to continue to the next trial.

Approximately 50% of the trials were marked as urgent or non-urgent (see Figure 3). Each trial was preceded with an urgency message displaying "Not Urgent" or "Urgent, Hurry up!!!". All trials included a black countdown timer in the center at the top of the screen (Figure 3). There was an additional count-up timer in the top right of the screen which differed according to the urgency message received. During urgent trials, the count-up timer was in red font, rapidly counting up to inform participants of the time they had spent on that particular trial. During not-urgent trials, the count-up timer was black and remained static at a value of 0. The count-up timer restarted at the beginning of each trial. Each trial concluded with a rating of subjective stress.

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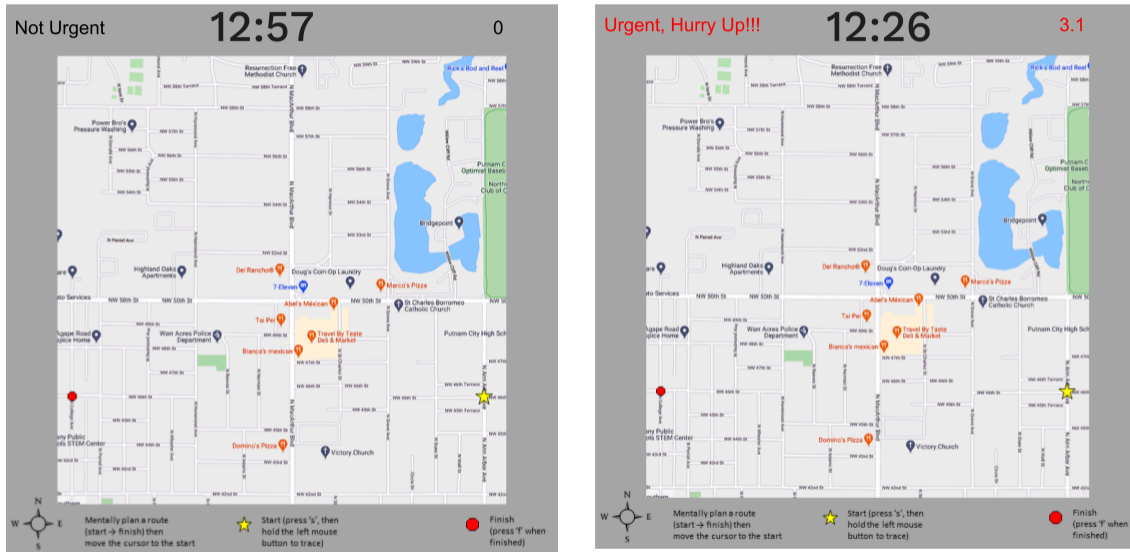


Figure 3. Comparison between “Urgent” trials and “Not urgent” trials. The countdown timer is featured at the center of the screen for all participants throughout the task. An additional count-up timer is featured in the top right corner of each trial. The count-up timer on “Urgent” trials is red and rapidly counts up to indicate time spent on each specific urgent trial, in contrast to “Not urgent” trials in which the count up timer is idle and in black font.

Subjective Stress. Using a Visual Analogue Scale (VAS), participants rated how stressed they felt from Not at all (0) to Extremely stressed (100). Participants were prompted with the question, “How stressed were you during this trial?” after each RPT trial.

Manipulation Check: Urgency Messaging. Once 15 minutes had elapsed, participants were prompted to report the total amount of time pressure experienced on “urgent” trials and “not urgent” trials using a similar VAS. Participants were asked “How much time pressure did you experience on urgent trials?” and “How much time pressure did you experience on not urgent trials?” from Not at all (0) to Extremely stressed (100).

Procedure

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Upon providing informed consent, participants completed eligibility items and then the Profile of Emotional Competence (PEC; Brasseur et al., 2013) to gauge self-awareness of emotional responding. Subsequently, participants completed the Multidimensional Assessment of Awareness and Interoception (MAIA; Mehling et al., 2012) or the RPT in counterbalanced order. After completing the RPT, or MAIA (depending on counterbalancing group), participants were redirected to a final questionnaire to report any emotion regulation strategies used to manage their stress. Measures including the PEC, the MAIA, and emotion regulation strategies that addressed a research question that is not included in the current analyses.

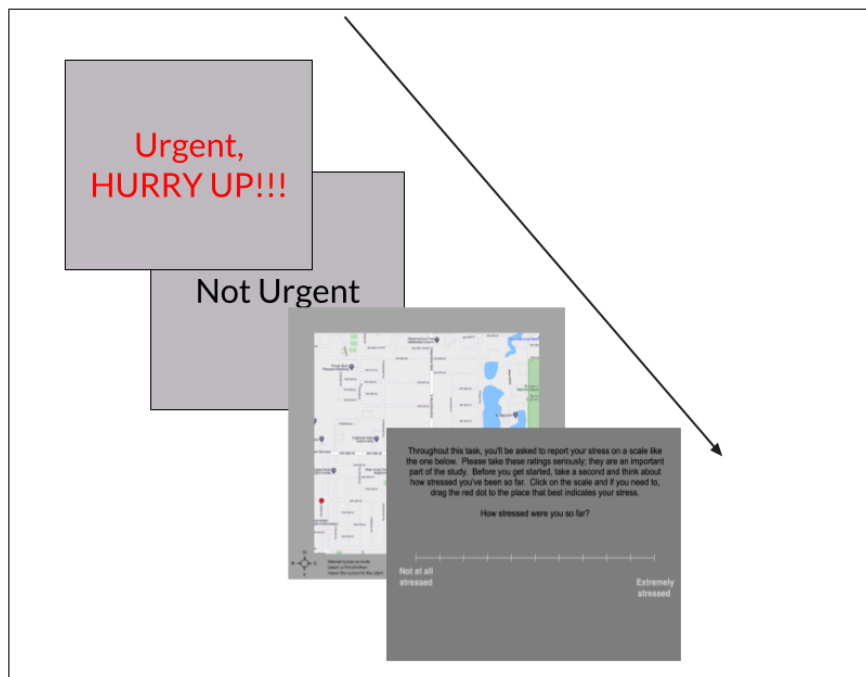


Figure 4. Task trial sequence for Study 1. Each map trial is preceded with an “Urgent” or “Not urgent” message indicating whether to complete the trial quickly, or at one’s own pace respectively.

Analysis Plan

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The current report pertains to self-report ratings of subjective stress recorded after each individual trial in the RPT. Behavioral measures captured in the RPT, such as planning time and route complexity, were not included as these results were not the focal point of the research question. Statistical analyses were conducted using R Studio (Version No. 2023.06.0+421) with a threshold of $\alpha = .05$. To examine differences in subjective stress as a function of urgency messaging, a paired t-test was conducted following trial-level exclusions (trials that had incurred planning time < 60s, or routes that did not follow the designated instructions).

Results

Manipulation Check: Urgency Messaging

There were two scores used per participant to assess whether time pressure manipulations increased subjective time pressure. The model (a paired t-test) used a single within-subjects factor with two levels; low urgency (“Not-Urgent”) and high urgency (“Urgent, Hurry Up!!!”). Results indicated a statistically significant increase in subjective stress in urgent trials ($M = 57.00$, $SD = 25.00$) compared to non-urgent trials ($M = 28$, $SD = 22.00$ $t(92)=14.25$, $p < .0000^2$, Hedges’ $g = 1.47$, 95% CI[1.17, 1.76]).

Subjective Stress

Following participant-level and trial-level exclusions, ratings of subjective stress were aggregated across total trials to compute an average mean stress per urgency condition (urgent, not urgent). A paired t-test was conducted to examine differences in subjective stress between urgent and non-urgent trials. Results indicated a statistically significant increase in subjective stress in urgent trials ($M = 42.00$, $SD = 25.00$) compared to non-urgent trials ($M = 31.2$, $SD = 20.46$, $t(92)=8.79$, $p < .001$, Hedges’ $g = 0.9$, 95% CI[0.66, 1.14]). Overall, distributions indicated a fair amount of variability with respect to the directionality of stress ratings from each

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urgency condition (see Figure 5).

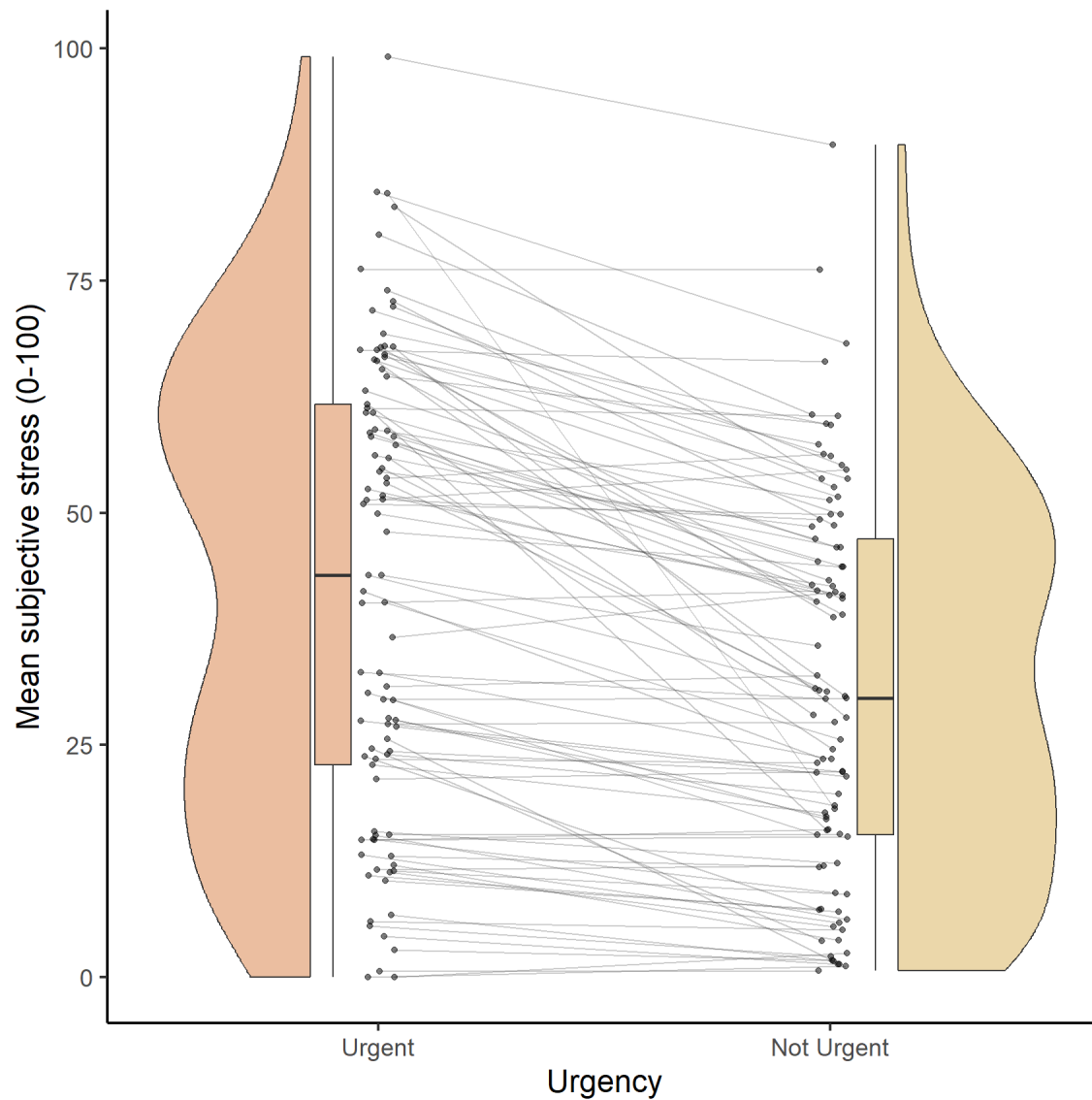


Figure. 5 Each point represents an individual's score of subjective stress. The lines that cross each distribution connecting each point indicate the direction, or comparison, of subjective stress in urgent and not urgent conditions for each participant. The median of each distribution is indicated by the black line in each box. The whiskers extending on either side indicate the 25th and 75th interquartile range of values.

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Discussion

Summary

Study 1 sought to investigate whether urgency messaging influences subjective stress. To accomplish this, participants completed a route planning task where half of the trials were preceded with urgent messages, while others were preceded with non-urgent messages. We hypothesized that urgency messaging would be associated with increases in subjective stress. Consistent with our hypothesis, findings indicate that the urgent condition prompted higher stress than the non-urgent condition. This observed increase in subjective stress is consistent with existing literature that imposing a sense of urgency leads to increases in stress (Plonski et al., 2025, Sussman & Sekuler, 2022).

Significance

The importance of the current study exists in the isolation of basic processes underlying responses to temporal pressure. By imposing a sense of urgency and measuring the subjective experience of stress, this study demonstrates a positive relationship with respect to urgency. We speculate that psychological processes (planning, decision making) may be negatively impacted as a result.

Limitations

Although Study 1 was successful in replicating the urgency effect, there are a few limitations with respect to the conclusions that can be drawn. Specifically, while it is evident that imposing urgency increases subjective stress, future studies may incorporate a measurement of physiological activity, such as heart rate and skin conductance to determine the strength of the stress response to urgency messaging and implications regarding the dynamic between urgency messaging and stress.

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Additionally, the current study does not provide an explanation for this relationship. In line with Lazarus (1966), it is plausible that increases in stress reflect an increase in cognitive demands under temporal pressure. Indeed, the need to shift one's strategy to a simpler, less complex strategy to minimize cognitive load demonstrates that temporal pressure is having a negative impact on the ability to process information in real time (Brunye et al., 2017). Thus, it may be informative to measure the perception of cognitive demands compared to the pressure exerted by urgency messaging.

Future Directions

Preceding trials with urgency messaging may have increased stress because it led participants to perceive time as a resource that was running too low to meet the demands of the task, a possibility to be tested in Study 2. This shows a difference in situation perception in urgent trials compared to not-urgent trials. What this study leaves unanswered is why we observe increases in subjective stress in urgent conditions compared to nonurgent conditions. We sought to answer why there are increases in stress due to urgency in Study 2.

Study 2

We know from Study 1 that imposing a sense of urgency leads to increases in subjective stress. What is less known are the underlying mechanisms for why this occurs. According to the Integrative Framework of Stress, Attention, and Visuomotor Performance (IFS; Vine et al., 2016), stress responses are influenced by the evaluation of demands and resources to cope. Specifically, if the situational demands (i.e., performing a surgery) outweigh one's personal resources (i.e., knowledge, expertise), an individual may perceive an inability to cope, triggering a state of threat. On the other hand, if personal resources meet or exceed the demands, this triggers a state of challenge.

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To investigate whether urgency messaging generates a similar response to the challenge and threat responses described in the IFS, Study 2 again used the route planning task (RPT) as a performance context and experimentally manipulated a time pressure similar to Study 1. To test the constructs discussed in the IFS, ratings of stress were used as a proxy for threat, and ratings of determination were introduced as a proxy for challenge. Additionally, to address the limitations of Study 1, Study 2 recorded ratings of demand (to proxy demand evaluations in the IFS) and ratings of preparedness (as a proxy for resource evaluations). Self-report ratings were recorded at the end of each RPT trial, enabling us to test whether increases in stress observed in Study 1 were due to a perceived increase in demands and decrease in resources during “urgent” trials, which could suggest that urgency messaging triggers a threat response described in the IFS.

To measure the subjective feeling states after each trial, we used an adapted version of the Evaluative Space Grid (ESG; Larsen, Norris, McGraw, Hawkey & Cacioppo, 2009). The ESG is a bipolar measurement instrument which enabled the collection of two ratings simultaneously. The ESG is most fitting for participants to rate an emotionally complicated situation likened to a comparison of how demanding a task is in comparison to how prepared they feel to complete the task, and similarly when considering the how stressed or determined one feels while performing the task.

Furthermore, the IFS posits that threat responses disrupt attentional systems and make one attend to irrelevant information. To test the interaction between time pressure and attention, Study 2 also introduced an attentional manipulation with three conditions. First, visual attention was directed toward the countdown timer at the top center of the screen to test whether reminding participants of time as a diminishing resource exacerbated the effect of urgency

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messaging. Second, visual attention was directed to the finish point to examine whether directing attention to stimuli that are directly relevant to the objective would restore balance to the attentional systems and thus reduce the effect of urgency messaging. Lastly, participants were given the option to choose where to direct visual attention as a control condition.

In sum, Study 2 enabled us to better understand the effects of urgency messaging on subjective stress. To do this, the current study introduced a novel variant of the RPT that incorporated a manipulation of time pressure and a manipulation of attention. Finally, to address limitations of Study 1, participants were prompted to report demand and resource evaluations (using demand and preparedness as proxies) in addition to reporting subjective experiences of challenge and threat (using determination as a proxy for challenge, and stress as a proxy for threat). We hypothesized the following:

Hypothesis 1: Urgency messaging will a) increase perceived demands and stress, and b) decrease perceived preparedness and determination.

Hypothesis 2: Directing attention to the countdown timer will a) increase perceived demands and stress, and b) decrease perceived preparedness and determination.

Hypothesis 3: There may be an interaction between attentional focus and urgency messaging such that the effects of urgency messaging described in H1 and H2 will be largest when focus is directed to the countdown timer compared to when focus is directed to the finish point.

Method

Transparency

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The hypotheses, methodology, and analysis plan for this study were preregistered via the Open Science Framework (see <https://osf.io/9ce3u>). Additionally, all data, code and additional materials used in this study will be made available via this OSF link: <https://osf.io/ry4ck>).

Participants

We recruited 152 participants through Prolific, a sample size determined by available financial resources. Participants included in the analytic sample ($N = 134$) passed verification of eligibility criteria (see Eligibility) and trial-level exclusions. In a sample of this size, a power analysis with an alpha of .05 determined that the current sample yielded 97% statistical power to detect Cohen's $f = 0.07$ or higher.

Eligibility

In addition to Study 1 requirements of 18yrs and residing in the US, participants were excluded if they had already participated in the RPT, preferred not to download navigation task resources, or used a touchscreen device. Participants were compensated \$9 USD to complete the 45-minute study.

Design

Like Study 1, Study 2 was conducted online via Prolific and Qualtrics. The current study utilized a within-subjects 2 x 3 factorial design. Urgency messaging was the first factor with two levels (urgent and non-urgent), and attentional focus was the second factor with three levels (countdown timer, endpoint, and control). Dependent variables include ratings of stress, determination, demand, and preparedness.

Materials

Route Planning Task. Participants completed a variant of the route planning and tracing task (RPT) programmed in PsychoPy. Similar to Study 1, the current study included a

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manipulation of time pressure (see Study 1 for details). Participants were still tasked with planning and tracing a route from the origin point to a finish point (and through any waypoints, if applicable). Similar to Study 1, map stimuli were randomly selected from an inventory of 120 static images from Google maps (without replacement) and participants were instructed to plan and then trace as many routes as possible without making tracing errors. A novel alteration to the RPT design was the use of a blocked trial format to incorporate an attentional manipulation with three conditions (see Figure 6). There was a total of 3 blocks with one designated attentional focus cue per block, 8 minutes each, for a total time of 24 minutes.

Instructions were given at the beginning of the task as an “Important Note”, first indicating the existence of attentional focus (AF) cues and using random assignment to designate which cue would be assigned for that specific block of trials. Each block began with either the prompt, *“For the next block of trials, please focus on the countdown timer ... Use the picture of a timer to help you remember”* for the countdown timer, *“For the next block of trials, please focus on the finish point ... Use the picture of a stop sign to help you remember”* for the finish point, or *“For the next block of trials, please focus on whatever you want... Use the picture of a plus sign to help you remember”* for the control condition (see Supplemental Materials 1.2). The order of blocked trials was randomized for each participant and each AF cue appeared in only one block.

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Figure 6. Exemplar of RPT attentional focus manipulation. Each map stimulus features an icon in the top right corner of the screen to remind participants which focal point to attend to per attentional block. Participants will attend to the finish point (red stop sign), the timer (black timer icon) or anywhere of their choice (blue cross).

Manipulation Check: Attentional Focus. At the end of each block, participants were prompted to report the percentage of time spent attending to one of the three AF cues using a constant sum response item. Participants were asked “During the last block, what percentage of the time did you focus on...?” with responses including “the countdown timer” in black font, “the finish point” in red font, or “something other than the countdown timer or finish point” in white font. Each prompt was accompanied by the relevant icon positioned to the left of the screen as a reminder of the AF cue during the block (Supplemental materials 1.2.1). Participants were instructed to make ratings from 0 to 100 in increments of 10. To advance to the next block, participant ratings had to sum to 100. Participants had the option to decline.

Manipulation Check: Urgency Messaging. Lastly, at the end of each block, participants were asked to report the amount of time pressure experienced for all the urgent trials, and the same for

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not-urgent trials on a single item visual analogue scale. Participants were prompted, “During the last block, how much time pressure did you experience during “urgent” trials?” and “During the last block, how much time pressure did you experience during “not urgent” trials?”. Responses were recorded using a VAS from No pressure (0) to Extreme pressure (100).

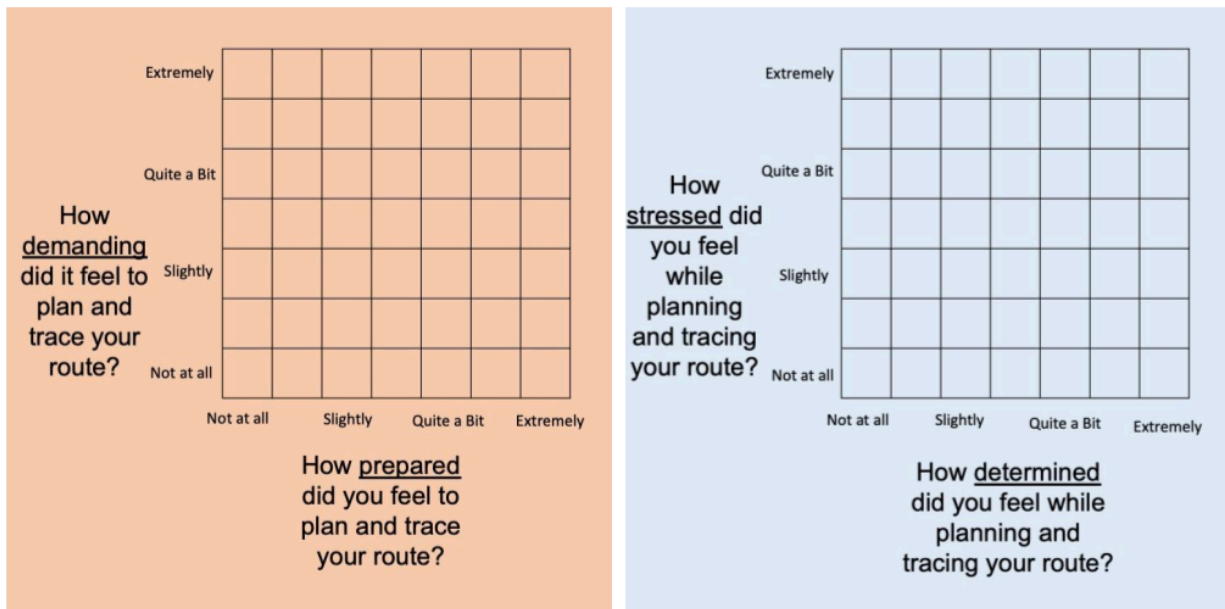


Figure 7. A bipolar measurement instrument used to capture emotionally complex situations.

Pictured is an adapted version of the Evaluative Space Grid from Larsen et al. 2009.

Demands and Resources. Using the ESG (adapted from Larsen et al., 2009), participants completed ratings for the perceived demands of the task while simultaneously rating how prepared they felt to complete the task (see Figure 7 above). Along the vertical dimension, participants were prompted with the question, “How demanding did it feel to plan and trace your route?” from *Not at all* (0) to *Extremely* (6). Simultaneously, participants were prompted with the question, “How prepared did you feel to plan and trace your route?” from *Not at all* (0) to

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Extremely (6) along the horizontal dimension. To make ratings, participants moved their mouse or trackpad to click on any of the 49 cells within the grid space (see Figure 8). If a participant felt the previous trial was quite demanding and felt ill-prepared, a rating may resemble the left panel in Figure 8. Each rating was captured using x and y coordinates; coordinates were converted into integers from 0 to 6 for analyses.

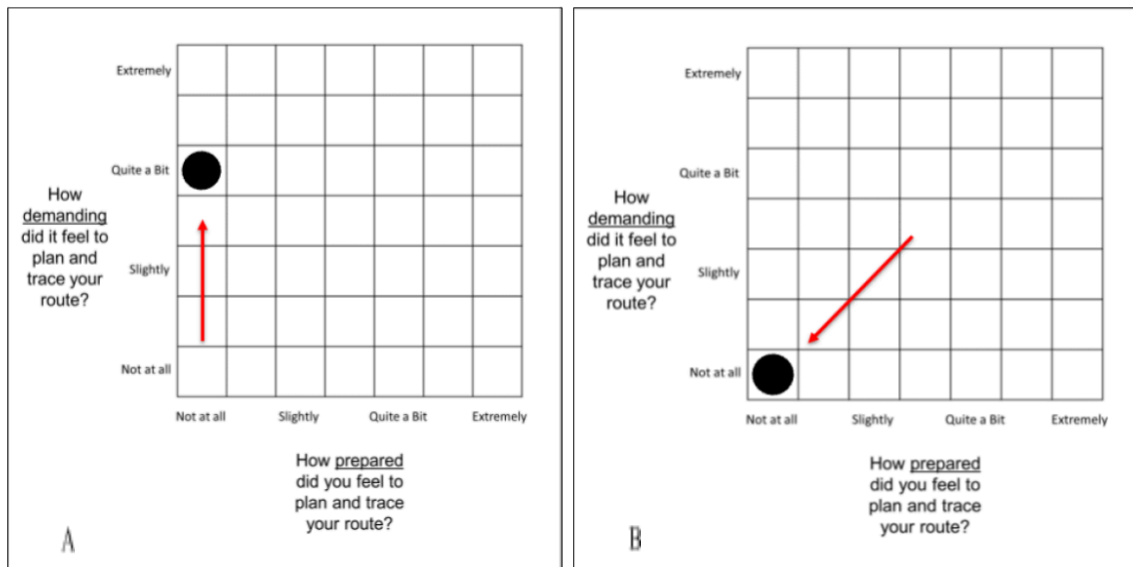


Figure 8. Example ratings of demand and preparedness. Higher placement of the marker implies a higher score on the vertical dimension (demand). The horizontal dimension indicates ratings of preparedness, used as a proxy for resources.

Stress and Determination. Similarly, a second ESG grid was used to measure ratings of stress and determination. Along the vertical dimension, participants were prompted with the question, “*How stressed did you feel while planning and tracing your route?*” from *Not at all* (0) to *Extremely* (6). Simultaneously, participants were prompted with the question, “*How determined did you feel while planning and tracing your route?*” ranging from *Not at all* (0) to

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Extremely (6) along the horizontal dimension. Each rating was captured using x and y coordinates; coordinates were converted into integers from 0 to 6 for analyses.

Profile of Mood States. Participants completed the Profile of Mood States (POMS; Grove & Prapavessis, 1992) prior to being redirected to the RPT to acquire a baseline of mood prior to eliciting stress, as well as at the end of the task to provide any indication in changes to mood following the stress manipulations in the RPT. However, these data are not relevant to this confirmatory report.

Procedure

Similar to Study 1, Study 2 was conducted entirely online. Upon providing informed consent via a Qualtrics survey, participants completed eligibility items and then the POMS to obtain a baseline of emotionality prior to enduring stress manipulations. Participants were then redirected to Pavlovia to complete the RPT. Before planning and tracing their routes, participants entered a practice phase where they received brief instructions on the RPT, followed by examples that demonstrated how to complete ratings on the ESG (Larsen et al., 2009). Participants were given an opportunity to practice planning and tracing and make ratings after each map (3 practice maps total).

Upon completion of practice maps, participants were shown two “Important Notes”. First, participants were informed that some trials would be marked “urgent” and that these trials would be timed, while other trials would be marked “not urgent” and these trials would not be timed (similar to Study 1). Next, participants were informed that they would be asked to pay attention to a specific aspect of the task in some blocks of trials, and that they could pay attention to whatever they preferred on other blocks of trials. Participants were informed of the global time

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(24 minutes) to complete a total of 3 blocks of trials and instructed to complete as many trials as possible without making any tracing errors.

In randomized order, each participant would receive instructions to attend to an AF cue (countdown timer, endpoint, control) and to use a designated icon as a reminder. After the initial instructions, each trial began with an AF cue. Participants then clicked a white circle on the right of the screen to advance to the urgency message designating that specific trial as “urgent” or “not urgent”, followed by the route planning and tracing phase described in Study 1. After participants planned and traced their route, they completed a rating of demand and preparedness on one grid, followed by ratings of stress and determination on a second grid (see Figure 9 for trial sequence). To distinguish between the demand and preparedness grid and the stress and determination grid, each grid was colored in either blue or orange. The colors of each grid were counterbalanced across participants to control for potential color effects.

At the end of each block, participants completed two self-report ratings; participants rated the percentage of time attending to the cue indicated at the beginning of each block and subsequently reported how much time pressure they experienced on “urgent” trials and “not-urgent trials”.

After 24 minutes elapsed, we thanked participants and asked that they wait for the completion button on the screen to indicate their responses had been recorded. Participants were then redirected to Qualtrics to complete the post-task POMS and reported their demographics before being redirected to Prolific, where their participation was marked as complete.

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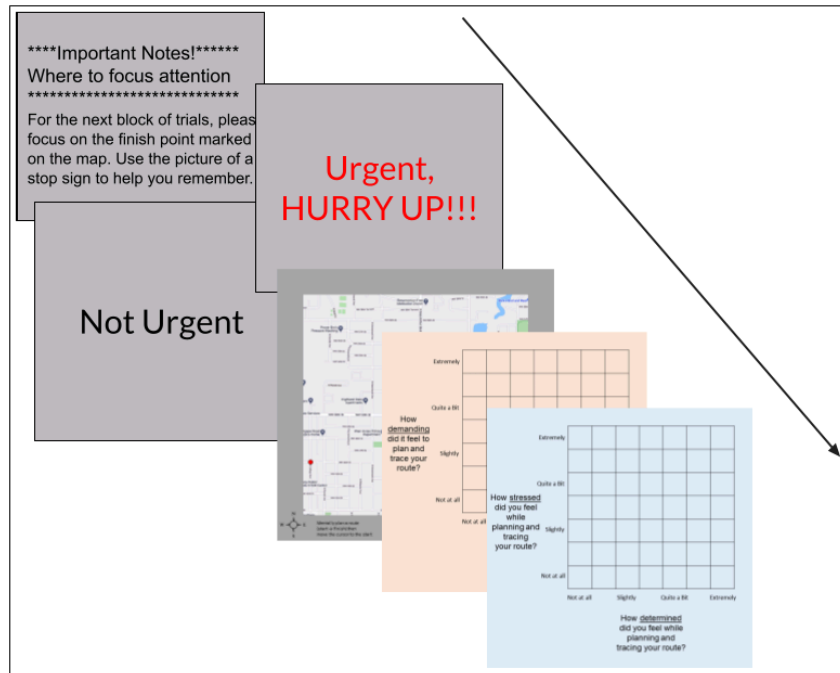


Figure 9. Task sequence following practice map trials. Each block consists of an attentional manipulation, urgent or not urgent trials, and self-report measures.

Analysis Plan

Analyses were conducted in R Studio (Version No. 2023.06.0+421). Similar to Study 1, Study 2 used a statistical significance threshold of $\alpha = .05$ for all analyses. Four within-subjects factorial ANOVA were conducted to examine the effects of urgency messaging and attentional focus on perceived stress, determination, demands, and preparedness. Independent variables were urgency messaging with two levels (urgent, not urgent) and attentional focus with three levels (endpoint, timer, control). See Table 1 to observe a summary of descriptive statistics and correlations between variables of interest.

Results

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Table 1

	<i>M</i>	<i>SD</i>	<i>95%CI</i>	1	2	3	4	5	6	7	8
1. demand	1.48	1.12	[1.4, 1.56]								
2. preparedness	2.68	1.18	[2.6, 2.77]	-.18**							
3. stress	1.45	1.15	[1.37, 1.53]	.84**	-.16**						
4. determination	3.04	1.06	[2.96, 3.11]	.14**	.70**	.09*					
5. focus on endpoint	47.97	23.36	[46.35, 49.59]	.04	.01	.04	.04				
6. focus on other	18.27	19.83	[16.88, 19.66]	-.02	.00	-.01	-.03	-.38**			
7. focus on timer	34.68	22.97	[33.09, 36.27]	-.03	-.01	-.04	-.03	-.65**	-.43**		
8. time pressure	53.91	27.94	[51.97, 55.85]	.16**	-.05	.16**	.02	-.23**	-.10**	.31**	
9. age in years	37.02	11.25	[36.24, 37.8]	.01	-.08*	.06	.00	-.04	.08*	-.02	.06

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

Hypothesis Testing

We hypothesized that (H1) urgency messaging would a) increase perceived demands and stress, and b) decrease perceived preparedness and determination. We also hypothesized that (H2) directing attention to the countdown timer would a) increase stress and demand and b) decrease preparedness and determination. Lastly, we hypothesized (H3) that the effects of urgency messaging would be largest in H1 and H2 when attentional focus is directed to the countdown timer, compared to when focus is directed to the endpoint. Figure 10 shows mean levels of stress (A), determination (B), demand (C), and preparedness (D).

Stress. In support of H1, results revealed a significant main effect of urgency messaging on mean ratings of stress ($F(1, 129) = 99.29, p < .001$), such that stress in urgent conditions was higher in urgent conditions ($M = 1.77, SE = 0.09$) than in not urgent conditions ($M = 1.15, SE = 0.07$). The effect size, eta squared $\eta^2 = 0.77$, a large effect. There was also a significant main effect of attentional focus on mean ratings of stress ($F(2, 258) = 5.29, p = .006$), such that demand ratings were higher when attention was directed to the countdown timer ($M = 1.56 SE =$

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0.08) than the endpoint ($M = 1.41$, $SE = 0.08$) and the control condition (1.38 , $SE = 0.08$). An eta of $\eta^2 = 0.041$ indicated a small effect. Consistent with H2, pairwise comparisons revealed that mean stress was significantly higher in the timer condition than in the endpoint condition, $M_{diff} = -.17$, $t(129) = -2.70$, $p = .020$. Contrary to H3, these effects were independent of each other, as there was no significant interaction between urgency messaging and attentional focus ($F(2, 258) = 0.41$, $p = .660$).

Determination. Contrary to H1 and H2, there were no main effects of urgency messaging ($F(1,129) = 0.29$, $p = .588$), nor attentional focus ($F(2, 258) = 0.60$, $p = .538$) on mean ratings of determination. Contrary to H3, there was also no evidence of an interaction between urgency messaging and attentional focus ($F(2,258) = 1.15$, $p = .316$).

Demand. In support of H1, results revealed a significant main effect of urgency messaging on mean ratings of demand ($F(1,130) = 78.17$, $p = <.001$) such that demand was higher in the urgent condition ($M = 1.73$, $SE = 0.09$) than in the not urgent condition ($M = 1.24$, $SE = 0.07$). The effect size, eta squared $\eta^2 = 0.77$, indicates this was a large effect. There was also a significant main effect of attentional focus on mean ratings of demand ($F(2, 260) = 6.79$, $p = .001$), such that ratings of demand were higher when attending to the timer ($M = 1.61$, $SE = 0.09$), than the endpoint ($M = 1.42$, $SE = 0.08$) and control ($M = 1.41$, $SE = 0.08$). Consistent with H2, pairwise comparisons revealed that mean demand was significantly higher in the timer condition than in the endpoint condition, $M_{diff} = -.16$, $t(139) = -2.70$, $p = .021$. An eta squared of $\eta^2 = 0.041$ indicated a large effect size. Contrary to H3, there was no evidence of an interaction between urgency messaging and attentional focus ($F(2,260) = 0.51$, $p = .598$).

Preparedness. In support of H1, results revealed a significant main effect of urgency messaging on mean ratings of preparedness ($F(1,130) = 23.39$, $p <.001$), such that ratings of

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preparedness were lower in the urgent conditions ($M = 2.60$, $SE = 0.09$) than in not urgent conditions ($M = 2.81$, $SE = 0.092$). The effect size, eta squared $\eta^2 = 0.18$, indicated this was a large effect. Contrary to H1, there was no significant main effect of attentional focus ($F(2, 260) = 1.59$, $p = .211$) on mean ratings of preparedness. Contrary to H3, there was also no significant interaction between urgency messaging and attentional focus ($F(2,60) = 1.31$, $p = .270$).

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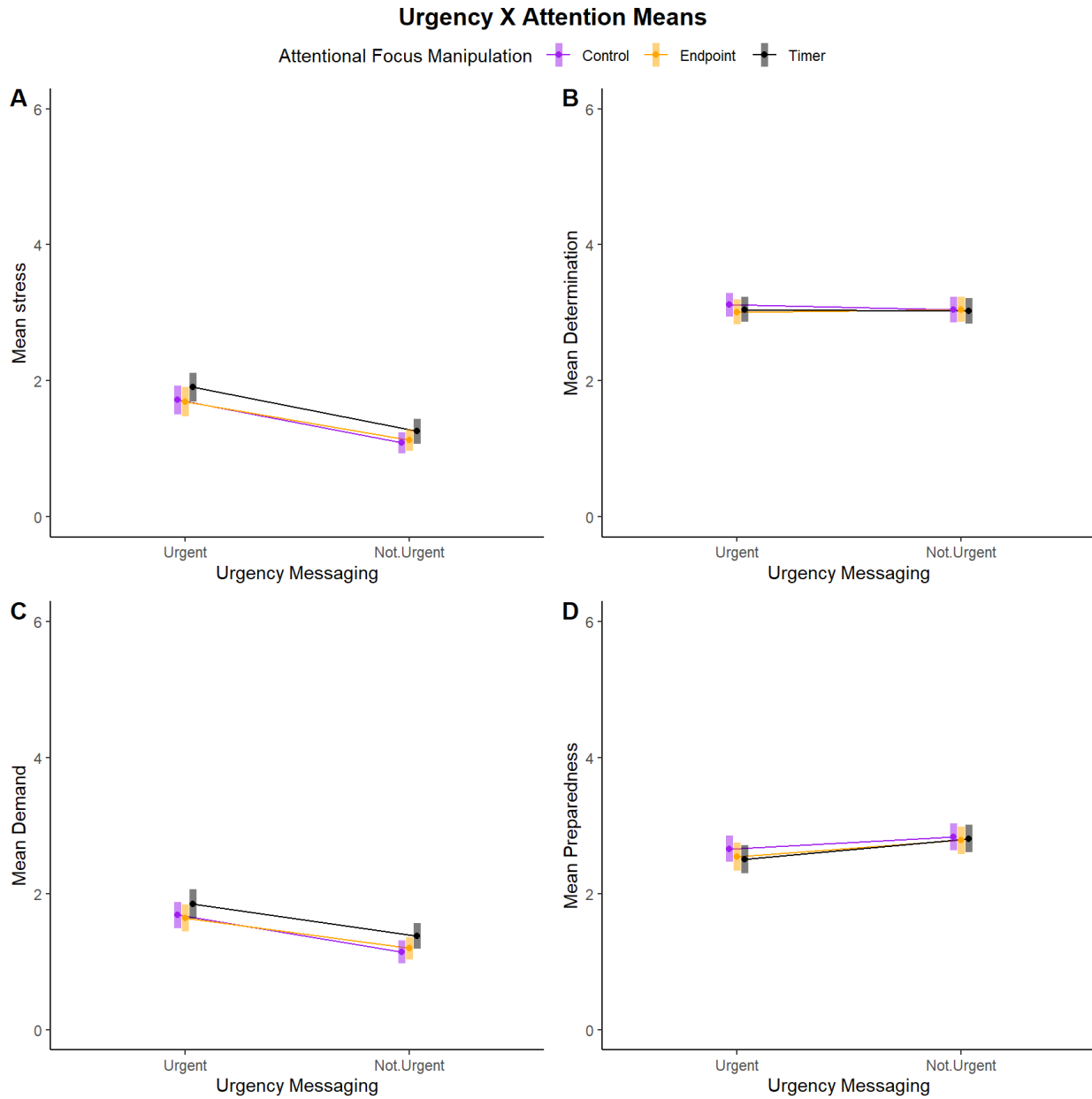


Figure 10. Mean scores of stress (A), determination (B), demand (C) and preparedness (D) aggregated across all trials separated in color by attentional focus condition (control in purple, endpoint in orange, timer in black).

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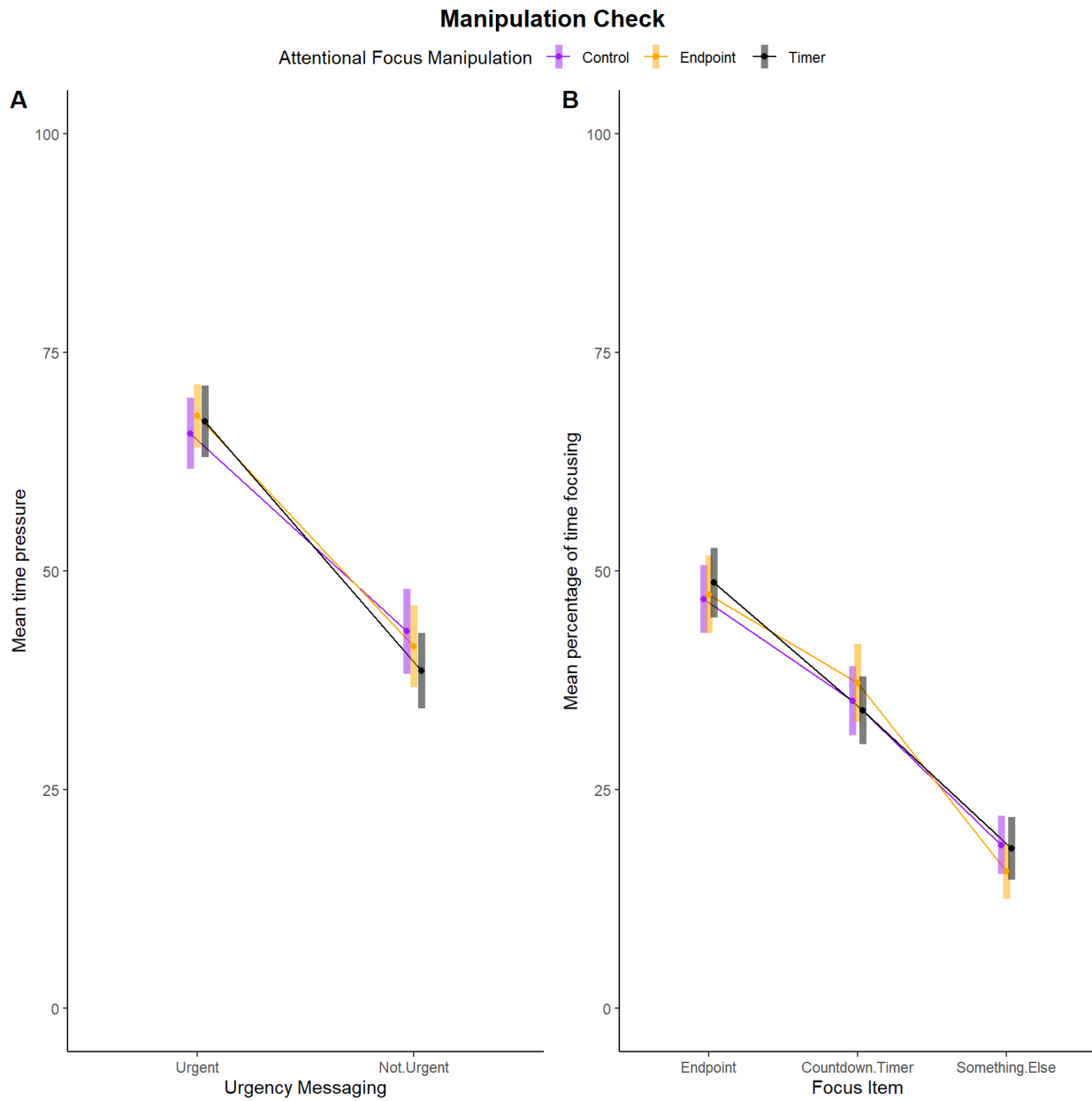


Figure 11. Mean ratings of subjective time pressure experienced on “urgent” and “not urgent” trials reported in Panel A. The percentage of time spent attending to the endpoint, the countdown timer, or something other else depicted in Panel B.

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Manipulation check: Experimental Manipulation of Urgency Messaging

We used two scores to measure the effectiveness of urgency messages on subjective time pressure. On average, participants reported higher time pressure on “urgent” trials ($M = 67.00$, $SE = 1.38$) than on “not urgent” trials ($M = 41.00$, $SE = 1.60$), $t(778)=15$, $p = .001$, Cohen’s $d = 1.06$, 95% CI[0.91, 1.21]) (see Figure 11). This result indicates that urgency messaging successfully generated a sense of urgency.

Manipulation Check: Experimental Manipulation of Attentional Focus

We compared the percentage of time focusing on the endpoint and the countdown timer in each AF condition (see Figure 11). Results suggest that participants spent a higher percentage of time attending to the endpoint ($M= 48$, $SE = 1.20$) than the countdown timer ($M = 35.00$, $SE = 1.32$) $F(1, 130) = 32.18$, $p = <.001$) irrespective of the AF cue designated for each block, suggesting that the attentional focus manipulation did not function as designed.

Discussion

The purpose of Study 2 was to seek an explanation for why we observed increases in stress under time pressure in Study 1. Study 2 was informed by the Integrative Framework of Stress, Attention, and Visuomotor performance (IFS; Vine et al., 2016) which conceptualizes responses to stress in a motivated performance situation. We surmised that time pressure elicits a threat response due to a perceived increase in demand and decrease in resources. We expanded on Study 1 by incorporating a manipulation of attentional focus and measures of stress, determination, demand, and preparedness to integrate constructs from the IFS into the context of time pressure. Study 2 used measures of determination and stress as proxies for challenge and threat, respectively, and measures of demand and preparedness as proxies of demands and

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resources, respectively. Results indicate that time pressure specifically triggers a state of threat and the reason this occurs is due to the perception of high demand and low resources.

Furthermore, results suggest that the manipulations of time pressure and attentional focus did not have a significant effect on states of challenge.

To examine the effects of urgency messaging, Study 2 manipulated time pressure similarly to Study 1. We hypothesized that urgency messaging would lead to increases in stress and demand and decreases in preparedness and determination. Findings provided evidence in support of Hypothesis 1a, such that stress and demand were higher during urgent conditions compared to not urgent conditions. Findings also indicated partial support for Hypothesis 1b demonstrating lower scores for preparedness on urgent conditions compared to not-urgent conditions. This finding suggests that increases in stress are due to an increase in perceived demands and a decrease in resources when experiencing time pressure. This provides preliminary evidence that time pressure fits in with the IFS as a motivated performance stressor that specifically elicits a threat response.

Additionally, Study 2 incorporated a manipulation of attentional focus to better understand the effects of time pressure. We directed attention in two ways. First, directing attention to the countdown timer enabled us to test whether reminding participants of time as a stressor would exacerbate the effects of urgency messaging. Second, directing attention toward the endpoint enabled us to test whether introducing top-down control of attention would remind participants of their goal, and lead to reductions in stress to potentially enable a challenge response. There was also a control condition in which participants could choose to attend wherever they preferred. We hypothesized that directing attention to the countdown timer would a) increase perceived demands and stress, and b) decrease perceived preparedness and

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determination. Results supported H2a, such that stress and demand were higher when attending to the countdown timer. There were no significant main effects of attentional focus on preparedness or determination.

These patterns suggest a parallel between the effects of urgency messaging and the threat response that emerges when faced with other stressors (Vine et al., 2016). Specifically, increases in stress during urgency conditions may be due to situational demands exceeding personal resources. It is likely that directing attention to the source of the time pressure reminded participants of the time constraints and led them to believe they did not have the necessary resources to complete the task. However, there was no statistically significant effect of attentional focus on determination or preparation as purported in H2b. Lastly, results contrasted with the H3 purporting that there would be an interaction between attentional focus and the urgency messaging manipulation. The lack of evidence in support of an interaction may be attributed to the attentional focus manipulation, as discussed below.

It is possible that the lack of an effect of attentional focus revealed a limitation inherent in the design of Study 2. There may have been a difference in predictability between urgency and attentional focus. Whereas participants could anticipate a trial being urgent or not urgent, they could not predict which of those conditions they would encounter. In contrast, attentional cues were constant across all trials within a single block. Therefore, participants had time to become familiar with attentional focus cues and could have demonstrated a more practiced effect in response to the attentional demands compared to the urgency effect.

Another limitation of this study was that although participants were given instructions on where to attend, there was no means of verifying whether visual attention was focused on the designated AF cue, nor the duration of fixation, without the use of an eye tracker. The sole means

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of checking adherence to the instructions relied on the manipulation check at the end of each block, the accuracy of which rests on individual differences in retrospective estimation that are subject to bias. The inability to monitor visual attention means we could not verify the construct validity of the attentional focus manipulation.

Lastly, with respect to testing the IFS framework, the placement of the self-report measures was not exact to the timing in which this framework purported they occur (see Figure 1). According to the IFS, an individual's evaluation of demands and resources is what informs the cognitive processes to follow, and the behavioral outcomes thereafter. In this study, the measures of demand and resource took place after the performance. This retrospective rating was enacted to preserve the effectiveness of the urgency messaging manipulation. If participants had been prompted to reflect on their ability to cope in between the urgency message and the planning and tracing phase, the effects of the urgency alert may have dissipated while participants made ratings, or ratings would have been rushed, impacting the quality of ratings and limiting the inferences to be made from the study.

General Discussion

The current work involves two studies: Study 1 was conducted to replicate the effect of urgency messaging on subjective stress. Study 2 was conducted to examine mechanisms underlying the effect of urgency messaging observed in Study 1. The overall goal of this thesis was to study the effects of time pressure on stress and elucidate potential mechanisms underlying negative responses to time pressure.

Advances in Understanding

Existing research on time pressure has found that perceived time pressure (PTP) is stressful (Plonski et al., 2025), and that effects of time pressure tend to include diminished

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cognitive inhibition (Sussman & Sekuler, 2022) and poor performance (Vine et al., 2014; Brimmell et al., 2019). This relation between time pressure had been studied in laboratory settings (Brunye et al., 2017), athletic contexts (Giancamilli et al., 2022), and professional contexts (Skinner & Brewer, 2002). Trends in research indicate a negative effect of time pressure, but little is known as to why these increases in stress and subsequent effects occur. The IFS provides a framework to test interactions between time pressure and cognition.

One contribution to the literature includes the method of time pressure used to generate stress. Existing research has induced time pressure using variable time constraints (Brunye et al., 2017) or intertrial intervals (ITI; Sussman & Sekuler, 2022). In this work, we utilized urgency messaging as a form of time pressure. Another contribution was to examine time pressure in the context of a motivated performance situation. In doing so, this work extends past research by examining how time pressure could interact with other cognitive processes such as attentional control and visuomotor control.

In alignment with previous research, Study 1 found that perceived time pressure leads to increases in stress (Plonski et al., 2025; Sussman and Sekuler, 2022). Specifically, the use of urgency messaging, simply telling someone to hurry up, elicits increases in stress. This suggests that self-generated time pressure, similar to objective time pressure, can have negative effects on subjective well-being and that this relation has implications for cognition and behavioral outcomes. We examined an example of such implications with Study 2.

Vine and colleagues posed the Integrative Framework of Stress, Attention, and Visuomotor Performance (IFS; Vine et al., 2016) which illustrates how cognitive processes interact during a motivated performance situation, set in motion following an evaluation of demands and resources (DRE). Study 2 applied this framework in the context of time pressure.

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First, we brought the DRE phase to conscious awareness by prompting participants to report levels of demand (as a proxy for demands evaluations) and preparedness (as a proxy for resource evaluations). Findings indicated that urgency messaging resulted in a perceived increase in demands and a decrease in resources.

Additionally, Study 2 examined challenge (operationalized as determination) and threat (operationalized as subjective stress) states in the context of time pressure. Findings indicated higher ratings of threat during urgent conditions compared to not urgent conditions. Combined with demand and resource ratings, results suggest that urgency messaging elicits a state of threat. There were null results with respect to challenge. This could be inherent to limitations of the study design, or it may be that simply the absence of a threat does not imply a state of challenge is to occur.

Finally, Study 2 tested implications of the IFS in two ways with respect to attentional resources. Specifically, we directed visual attention to either the countdown timer or the end point. First, by directing attention to the countdown timer, we set out to investigate whether the effects of urgency would be exaggerated if participants were constantly reminded of the passage of time. Second, by reminding participants of their goal (to plan and trace a route to the endpoint), we sought to examine whether this reminder would reinforce goal-driven attentional systems that were said to be disrupted during stress.

Future Directions

There are myriad directions the current research could be advanced. We intend to make our data and materials available, so that future researchers may take advantage of our foundation and pave the way for interesting applications of the basic research of this thesis.

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This work provides a first glance at how time pressure situations are appraised. The guiding framework for this work was the IFS, with this work touching the surface of the DRE phase. Future work can seek to characterize the resources that could aid in the confidence to perform under time pressure. For instance, Meijen and colleagues describe examples of resources that include self-efficacy, perceived control, achievement goals, and emotional states (Meijen et al., 2013). Findings suggested that achievement goals played a huge role in a threat response (Meijen et al., 2013). In combination with findings from the current work, future studies could examine achievement goals prior to performance, and measure variability in response to time pressure according to approach and avoidance-oriented goals.

Another potential direction includes methods of coping with a threat response during time pressure. The current work indicates that imposing a sense of urgency results in a state of threat, but we do not probe the evaluation of threat beyond a numeric rating of stress. One study examined a means to bring awareness to a threat state using the Think-Aloud method. Specifically, McGreary et al., 2020 examined verbalizations during a state of threat to find that participants' focus was fixated on the stressor and less so on ways to cope with the stressor. For example, some forms of coping can include efforts to reduce the emotional response to the stressor (emotion-focused coping; Nicholls et al., 2014), or efforts to master aspects of the stressful situation (task-oriented coping; Gaudreau, El Ali, & Marivain, 2005). While the specific cognitive resources to overcome a situation will vary according to the stressful context, one direction could be to test the effectiveness of different forms of coping across modes of time pressure.

On a similar note, future work may examine a particular context that involves time pressure and coping. The current studies utilized a simulated wayfinding task, which utilizes

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experience with 2D maps, or spatial abilities, and potentially emotion regulation strategies to effectively cope given the short timespan per trial. Future work could extend the current studies by identifying what types of coping are available for acutely stressful situations with demands inherent to fine motor tasks. One such study examines a context relevant for fine motor movements and time pressure in the context of a gaming competition. Behnke et al., (2024) sought to examine the effectiveness of synergistic mindsets intervention (SMI) on negative affect in a high-stakes esports competition. The SMI training included reappraising a stressful situation as an opportunity for growth and mastery (Behnke et al., 2024). With the short amount of time during trials in the current study, training beforehand that instills a form of reframing a stressor may prove to be effective when triggered by urgent conditions that diminish the state of threat. Such efforts could inform literature on time pressure and performance simultaneously.

Broad Implications

Beyond the current work, these findings have implications that can be applied to any performance context that involves a high-stakes situation. One such area includes aviation. For instance, Vine et al., (2014) examined responses to stress during a simulated engine-failure assessment, in which higher stress was associated with poor performance during time pressure. Aviation provides high pressure on pilots to perform well under an extremely stressful situation, which has implications for the safety of themselves and their passengers. The current work provides a basic understanding of time pressure and cognition- specifically informed by evaluations of one's ability to cope in context of the situational demands. The measurement of the evaluative state has implications to better define the cognitive demands of aviators and develop research-based interventions to lower cognitive demand, or to learn how to best prepare for situations that call for high action and high cognitive demand. Specifically, the evaluative

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space grid used in the current work (ESG; Larsen et al., 2009) provides but one mechanism of soliciting evaluations. The aspect of bringing evaluations to conscious awareness may provide insights into aspects of exigent circumstances that seem out of one's control.

Concluding Comment

Across two studies, we have effectively induced perceived time pressure via urgency messaging and demonstrated links to stress (Study1) and elucidated mechanisms underlying stress responses due to urgency messaging (Study 2). The overall goal of both studies was to advance understanding of the link between time pressure and stress, and to provide insight into the mechanisms underlying increases in stress under time pressure. Study 2 found that increases in stress may occur due to an increase in demand and a decrease in resources. We tested the role of the demand and resource evaluation stage embedded in the IFS and found that time pressure elicits a threat response, and findings supported this hypothesis. Additionally, we tested the influence of top-down control on the perception of demands and resources in Study 2. Findings indicate that attentional manipulation affected threat but had no significant impact on challenge states. Further work is necessary to investigate whether top-down control can be trained to combat the effects of a threat response. Future directions for research suggest avenues to do so.

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Supplemental Materials

1.1 Study 1 Urgency Messaging Instructions

Importantly, some trials are URGENT. We will be timing those trials specifically, so you will see an extra *count-up timer* and the words “*Urgent, Hurry up!!!*” on the screen.



1.1.1 Urgency Manipulation Check

During the last block, how much time pressure did you experience during the "urgent" trials?

No pressure | Extreme pressure

During the last block, how much time pressure did you experience during the "not urgent" trials?

No pressure | Extreme pressure

Please check whether you rated both items above. Press 'd' when you're done.

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1.2 Study 2 Attentional focus instructions.

For some blocks of trials, we will ask you to pay attention to a specific aspect of the task. In other blocks trials, we will ask you to pay attention to whatever you want.

Attention – countdown timer

For the next block of trials, please focus on the countdown timer at the top center of the screen. Use the picture of a timer to help you remember.

***Attention – finish point***

For the next block of trials, please focus on the finish point at the top center of the screen. Use the picture of a stop sign to help you remember.

***Attention – control***

For the next block of trials, please focus on whatever you want. Use the picture of a plus sign to help you remember.

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During the last block, what percentage of the time did you focus on...



...the countdown timer?

0 10 20 30 40 50 60 70 80 90 100 decline



...the finish point?

0 10 20 30 40 50 60 70 80 90 100 decline



...something other than the countdown timer or finish point?

0 10 20 30 40 50 60 70 80 90 100 decline

Your ratings should add up to 100%.

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Figure 1.2.1 *Attentional manipulation check to report the percentage of time spent attending to an AF cue using a constant sum rating method. Participants reported ratings at the end of each block.*

1.3 Evaluation Space Grid of Demands and Resources

After planning and tracing a route on each trial, we will ask you to rate how **demanding** it was to plan and trace each route and how **prepared** you felt to do so. We will also ask you to rate how **stressed** and **determined** you felt while planning and tracing each route.

You will make your ratings on two different grids. We will explain how to make ratings on a grid next. **Please read the instructions carefully.** Grid ratings may be different from other ratings you have made in the past

The figure displays two 5x5 evaluation grids. The left grid, with an orange background, is used for rating 'demanding' and 'prepared' feelings. The right grid, with a blue background, is used for rating 'stressed' and 'determined' feelings. Both grids use a 5-point Likert scale with labels 'Extremely', 'Quite a Bit', 'Slightly', and 'Not at all' on the vertical axis, and 'Not at all', 'Slightly', 'Quite a Bit', and 'Extremely' on the horizontal axis.

Figure. 4 Evaluative Space Grid adapted

from Larsen et al. (2009).

Demands and Resources

TIME PRESSURE AND STRESS

One way to describe your experience is by using an evaluative space grid. Think of this grid as a map for feelings. On this grid, you will rate how **demanding** it was to plan and trace each route and how **prepared** you felt to do so.

Description: The evaluation space grid (ESG) allows participants to rate what may be an emotionally complicated situation- such as whether they felt they were able to cope or if the situation outstripped the mental resources to do so. For instance, an urgent trial that solely includes an origin point and a destination may be perceived to be less demanding than an urgent map with an additional waypoint.