For optimal functioning in the real world, people must constantly adapt to a fluctuating environment that imposes cognitive demands on them. While tightly controlled lab-based assessments can offer important insights, a more ecological understanding of cognitive processing can be gained by examining individuals in their personally relevant and naturally occurring contexts. My research program integrates basic and applied perspectives to understand *how* people can optimally adapt to cognitive demands present in real-world contexts. I conduct this work across three kinds of contexts – 1) socioemotional daily stressors[#4,7-8,10-12,15,17,23,28-29,40-43,50,R3,R4,R10,R13], 2) climate change[1-3,5-6,9,14,45-46,R1-2,R5-9,R12,R14], and 3) interactions with technology[12-13,16,18-22,24-27,30-39,47-48,50,R11]. My research adopts a multi-method approach, including self-report (e.g., ecological momentary assessment; EMA[1-2,4-6,8-11,15,17,23]), behavioral[5,16,18,21,28,30,31,40-41,43,45] (e.g., eye-tracking and reaction time), and psychophysiological[4,13,16,19,24,26,29-30,35,40] (e.g., cardiovascular and electroencephalography) measures. The overarching goal of my research is to facilitate healthy self-regulation, performance, and wellbeing. To this end, I direct the *Applied Cognitive Regulation Lab* (Dept. of Psychology, University of Utah), where I am pursuing the following lines of research:

1) Affect Regulation in the Face of Socioemotional Daily Stressors. Difficulty with adaptation to personally relevant stressors predicts adverse performance and wellbeing[4,7,15,17,40,43,49-51]. To optimally adapt to socio-emotional stressors, it is important to understand which affect regulation strategies are effective in meeting one's goals[7,15,40,43]. In my work, I have examined how cognitive and behavioral strategies can facilitate or impede adaptation to ongoing affective challenges in real-world contexts[7,15,R3]. For example, using EMA, my students and I have investigated how people regulated naturally occurring daily stressors during the COVID-19 pandemic[17]. Extending past lab-based work[29,40], certain adaptive cognitive and behavioral strategies (e.g., reappraisal, acceptance, savoring, social sharing, calming, and problem-solving) were associated with better affective experiences among students (N=93) during the pandemic[17]. Thus, how people regulate their real-world emotional challenges has implications for their mental health.

   Individual differences modulate affect regulation. Furthermore, individuals differ in their use of affect regulation strategies, thereby determining their effective adaptations to stressors. One individual difference relevant to adapting to academic stressors is having *purposefulness* (i.e., having personally meaningful goals and directions in life). In a semester-long study[15] of first-year undergraduate students (N=256), purposefulness was a critical individual difference factor that explained both greater use of adaptive affect regulation strategies (e.g., planning and problem-solving) and less use of maladaptive strategies (e.g., rumination and experiential avoidance). In ongoing work, we are examining the instrumental role of affect regulation, even when it requires engaging with negativity, in order to meet one's personal goals and live a purposeful life across the lifespan[R13,50].

   Another individual difference variable relevant for adaptation is the ability to *accurately anticipate and effectively regulate* stressors[8]. My students and I found (N=146) that those who anticipate upcoming stressors and proactively implement more approach-oriented affect regulation strategies (e.g., acceptance and cognitive reappraisal) experience higher daily wellbeing[R3]. In contrast, those who anticipated stressors and adopted avoidance-oriented strategies (e.g., expressive suppression) had lower daily well-being. At the same time, in a national community sample (N=341), we found that those who anticipated discrimination experienced more stress and adverse physical health[R10]. Consequently, *everyday discrimination* is another individual difference that can create vulnerability for overall wellbeing, potentially shaping the effectiveness of specific emotion regulation strategies[R10]. For example, savoring positive feelings, a traditionally adaptive strategy, is found to predict lower daily wellbeing among those who frequently encounter everyday discrimination[F1]. Together, these findings underscore the significance of identifying individual differences (such as purposefulness, anticipation of stressors, and everyday discrimination) in understanding the connections between affect regulation and daily wellbeing.

   Training affect regulation skills. In addition to understanding effective affect regulation, another line of my research focuses on applying it to evaluate evidence-based interventions to promote mental health outcomes. For instance, 8 weeks of attention training[23] (N=34) improved the ability to use acceptance and reappraisal and reduced emotional distress (supported by a *Mind & Life* grant; PI: Lohani). In the context of suicide prevention, timely interventions are necessary so that high-risk individuals get help to identify their personal warning signs and adopt coping strategies to manage emotional dysregulation. To that end, I received an intramural grant (PI: Lohani) to conduct a longitudinal study to examine the effect of collaborative activities between therapists and high-suicide-risk individuals (N=82) on their suicide ideation and behavior. We found that interventions designed to facilitate client-therapist collaboration reduced suicidal ideation to a larger degree than the group with no collaborative activities[10]. Furthermore, this study examined the suitability of a suicide prevention intervention provided via telehealth to a national sample that was effective in reducing suicide risk up to 45 days after receiving therapy[11]. Moreover, maladaptive strategies like self-blame, avoidance, and procrastination were associated with higher suicide ideation[F2]. In ongoing analysis, I am examining how collaborative interventions impact specific emotion regulation efforts, which should be an important focus for future targeted and scalable interventions designed to reduce suicide risk.

2) Affect Regulation in the Context of Climate Change. Climate change is a divisive topic that elicits a wide range of responses among people, which can ultimately inform climate-friendly actions or inaction[2,3,5-6,9,14,45-46]. While the long-term effects of climate change are well-documented, recent work has shown that it also has impacts on day-to-day life[R1]. Furthermore, climate change interacts with governmental and commuting stressors, contributing to a complex experience of adverse daily wellbeing[R1]. However, there remains a limited understanding of how people adapt to the challenges of climate change. Across several studies that I have led[2,3,R2,R5-7], we have recommended that understanding how people manage their emotional reactions to climate change is crucial for *both* maintaining personal wellbeing and fostering openness to climate action. To capture the diverse emotion regulation approaches that vary among individuals dealing with climate change, I have led the development and validation of a novel comprehensive inventory that includes nearly 60 climate-related affect regulation strategies ($N_{Study\ 1}$=592). This resulted in the *ECO-SHADOW inventory*[R5], which has nine scales that emerged through factor analysis: *E*co-consciousness, *C*onflict, *O*utcast, *S*pirituality, *H*ope, *A*pathy, *D*oom, *O*verplay, and *W*ithdrawal. Ongoing iterative data collection is underway to improve this measure ($N_{Study\ 2}$=800). It

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[#] is a published paper numbered in my CV; R# is under review and F# is a Forthcoming paper in the Addendum.

was used in three[2,R6,F3] projects conducted at a climate change exhibit called *A Climate of Hope* at the Natural History Museum of Utah (NHMU), as described below.

   Insights from a climate change museum exhibit. Museums are trusted public institutions that provide open and informal spaces that are well-situated to engage the public in learning about climate change[2,5-6,9,45-46,R6,R8,R12]. In a recent study I led, the emotional responses of museum visitors to science-based climate information were linked to the emotion regulation approaches they typically adopt (N=183)[2]. We found that people who typically employed more avoidance and apathy as emotion regulation strategies (specific to the climate change context) experienced subdued emotions and had fewer concerns about climate change. In contrast, those who engaged in planning and problem-solving experienced more intense emotions and had more climate-friendly engagement[2], highlighting the instrumental role emotions play in personally relevant contexts. Furthermore, these findings suggest that how people manage their responses to climate change is not only linked to personal wellbeing, but may play an underlying mechanistic role in motivations to engage and act in an environmentally friendly manner. In ongoing work, I continue to examine how to find a balance between personal mental health and the adoption of more proactive emotion regulation strategies to support sustainability efforts[R2,R7].

   Insights from students of climate science. In a related line of inter-department collaborations[C1], I led two projects to study how students learning about the climate crisis are coping with climate change. Climate anxiety and distress are highest in young college-aged adults, making them a valuable population to learn from. Undergraduates (N=548)[R2] taking courses offered by the *School of the Environment, Society & Sustainability* with a focus on global climate change, reported their emotions and coping mechanisms. A key finding was that eco-conscious behaviors (e.g., advocacy, planning, and problem-solving), self-care (e.g., exercise), and social support were the most frequently used strategies reported for managing climate distress. In a follow-up study (N=71)[R7], students were asked which strategies were most effective in managing their emotions after completing in-class discussions on the climate change crisis. Extending prior findings[R2], we found that most students struggled to find effective ways to regulate their climate distress and shared the need for better mental health resources. These findings inform pedagogy and the development of evidence-based mental health resources that equip current and future generations to effectively adapt to and mitigate the climate change crisis[14,R2,R7,R14].

   Insights from historically marginalized communities. Historically marginalized communities are experiencing the worst effects of climate change; however, their experiences and needs remain unheard, thereby imposing systematic disparities in communities at the forefront of the climate change crisis[3]. Knowledge, affective, and sociocultural factors shape perspectives toward climate issues and should be considered[3]. Ongoing work in my lab is examining the cumulative environmental stressors experienced first-hand by marginalized communities in the greater Salt Lake City area[3] and identifying practical solutions and strategies to support effective adaptation to the climate change crisis.

3) Interaction with Technology. With everyday interactive technologies on the rise, it has become increasingly important to integrate social dynamics to improve user interaction as they impact available cognitive resources for optimal performance[12,22,27,31-39,47-48.] I have demonstrated that team-building efforts (e.g., rapport, cooperation, and collaboration) via interactive virtual agents[38,47-48] can improve users' trust and reliance on technology in real-world decision-making tasks (e.g., search-and-rescue missions for Air Force Intelligence Analysts) and users' perceived ability to cope with stress[33,36]. Together, these findings highlight the relevance of integrating team-cognition-focused interactions in calibrating human-technology interaction and performance[34,47,48].

   I have also conducted a complementary line of work examining cognitive demands experienced by motorists while interacting with self-driving technology on actual highways. This research investigates the cognitive regulation demands (e.g., distraction) of driving partially automated vehicles by simultaneously assessing cognitive performance and associated psychophysiological outcomes. Extending my interest in multi-modal assessment in applied settings[29,35,40-41], I led a large-scale review[26] discussing the benefits of (and challenges to) adopting psychophysiological measures to evaluate cognitive states in real-world automation research. This review was highly impactful[E], and directly informed the development of a project (N=71)[16,20,24] to evaluate cognitive demands in a representative sample of younger and older motorists operating automated vehicles on real roads. With multiple pilot efforts, I established the real-world psychophysiology assessment protocol and trained all team members. Follow-up analyses[13] revealed acceptable to very high test-retest reliabilities across all measures, addressing concerns regarding the reliability of these multi-modal measures in assessing cognitive demand in real vehicles. Given my interest in adaptation to real-world stressors, my students and I are also exploring effective emotion regulation in simulated stressful driving contexts in ongoing work[12].

Additional Ongoing Multi-method and Real-world Research: Extending the feasibility of multi-modal assessment to personally relevant stressors[26,29], through an intramural grant (PI: Lohani), I am examining how hourly ambulatory physiological measurement can be integrated with EMA from people experiencing work stressors over the course of a day[4]. Self-reported stress levels in response to real-life stress events were linked to changes in physiology (e.g., heart rate), supporting the feasibility of adopting these methods in ecological settings. Relatedly, in environmental science research, my students and I have discussed the benefits of adopting tools from psychological science, such as EMA[1] and mobile eye tracking[R8], which can help capture dynamic changes in real-time attention and emotion. To extend recent work[2,5,9,R5-6,R8], my lab recently finished data collection on a novel study that adopted both EMA and mobile eye tracking (N=50) to study how museum visitors attend to emotion-provoking climate crisis information and if that predicts what they subsequently remember and how they behave over the following month-long period[F3]. In an ongoing interdepartmental collaboration[C2], real-time data from EMA, heat sensors, and air-quality monitors are being combined to examine the compounding impact of exposure to extreme heat and air pollution on cognition and health in urban Utah. Moving forward, I plan to continue adopting a multiple-method approach to investigate applied cognition constructs relevant to my interdisciplinary research program.

[C1] Collaboration with the Environment, Society & Sustainability, Educational Psychology, Communication Depts.
[E] Cited nearly 340 times since 2019 with the "Editor's Choice" designation in Cognitive Neuroscience in 2021
[C2] Environment, Society & Sustainability, Urban planning, and Chemical Engineering, Occupational & Environmental Health Depts.