

Qualitative and quantitative evidence of motivation states for physical activity, exercise and being sedentary from university student focus groups

Matthew Stults-Kolehmainen ^{1, 2} †*

Todd A. Gilson ³ †

Nicholas SantaBarbara ⁴

Paul McKee ⁵

Rajita Sinha ⁶

John B. Bartholomew ⁷

Daniel Boullosa ⁸

Christopher J. Budnick ⁹

Fabio Amador Bueno ¹⁰

Adrian Haughton ¹¹

Jessica L. Barker ¹²

Garrett I. Ash ^{11, 13}

† These authors contributed equally to this work and share first authorship

¹ Digestive Health Multispecialty Clinic, Yale New Haven Hospital, New Haven, CT, United States

² Department of Biobehavioral Sciences, Teachers College – Columbia University, New York, NY, United States

³ Department of Kinesiology and Physical Education, Northern Illinois University, DeKalb, IL, United States

⁴ Department of Exercise and Rehabilitation Sciences, Merrimack College, North Andover, MA, United States

⁵ Center for Cognitive Neuroscience, Duke University, Durham, NC, United States

⁶ Yale Stress Center, Yale School of Medicine, New Haven, CT, United States

⁷ Department of Kinesiology and Health Education, The University of Texas at Austin, Austin, TX, United States

⁸ Integrated Institute of Health, Federal University of Mato Grosso do Sul, Campo Grande, Brazil

⁹ Department of Psychology, Southern Connecticut State University, New Haven, CT, United States

¹⁰ Connecticut Community Colleges Nursing Program, Gateway Community College, New Haven, CT, United States

¹¹ Center for Medical Informatics, Yale School of Medicine, New Haven, CT, United States

¹² University of Minnesota, Department of Psychiatry and Behavioral Sciences, Minneapolis, MN, United States

¹³ Center for Pain, Research, Informatics, Medical Comorbidities and Education Center (PRIME), VA Connecticut Healthcare System, West Haven, CT, United States

* Please, send correspondence to Matthew Stults-Kolehmainen: matthew.stults@ynhh.org

Number of words: 9,235

Number of Tables and Figures: 7 total; 5 tables, 2 figures

Number of Supplements: 7

Co-Author Agreement: We the authors agree to the sharing of this preprint on SportRxiv.

All authors have read and approved this version of the manuscript.

This article was last modified on August 29, 2022.

This work is a preprint (has not been peer-reviewed yet).

Please cite as: Stults-Kolehmainen MA, Gilson, TA, SantaBarbara, N, McKee, P, Sinha, R, Bartholomew, JB, Boullosa, D, Budnick, CJ, Bueno, FA, Haughton, A, Barker, JL & Ash GI (2022). Qualitative and quantitative evidence of motivation states for physical activity, exercise and being sedentary from university student focus groups. SportRxiv.

ABSTRACT

Motivation for physical activity and sedentary behaviors (e.g., desires, urges, wants, cravings) varies from moment to moment. According to the WANT model, these motivation states may be affectively-charged (e.g., felt as tension), particularly after periods of maximal exercise or extended rest. The purpose of this study was to examine postulates of the WANT model utilizing a mixed-methods approach. We hypothesized that: 1) qualitative evidence would emerge from interviews to support this model, and 2) motivation states would quantitatively change over the course of an interview period. Seventeen undergraduate students (mean age = 18.6, 13 women) engaged in focus groups where 12 structured questions were presented. Participants completed the “right now” version of the CRAVE scale before and after interviews. Qualitative data were analyzed with content analysis. A total of 410 unique lower-order themes were classified and grouped into 43 higher order themes (HOTs). From HOTs, six super higher order themes (SHOTs) were designated: 1) wants and aversions, 2) change and stability, 3) autonomy and automaticity, 4) objectives and impulses, 5) restraining and propelling forces, 6) stress and boredom. Participants stated that they experienced desires to move and rest, including during the interview, but these states changed rapidly and varied both randomly as well as systematically across periods of minutes to months. Some also described a total absence of desire or even aversion to move and rest. Of note, strong urges and cravings for movement, typically from conditions of deprivation (e.g., sudden withdrawal from exercise training) were associated with physical and mental manifestations, such as fidgeting and feeling restless. Urges were often consummated with behavior (e.g., exercise sessions, naps), which often resulted in satiation and subsequent drop in desire. Importantly, stress was frequently described as both an inhibitor and instigator of motivation states. CRAVE-Move increased pre-to-post ($p < .01$). CRAVE-Rest demonstrated a trend to decline ($p = .057$). Overall, qualitative and quantitative data largely corroborated postulates of the WANT model, demonstrating that people experience wants, desires and cravings to move and rest, and that these states appear to fluctuate significantly, especially in the context of stress, boredom, satiety and deprivation.

KEYWORDS

Motivation, motivation states, desires, physical activity, exercise, qualitative, focus group, stress

INTRODUCTION

Physical inactivity and sedentarism plague the United States and other developed countries. Sitting time, not including other sedentary behaviors like napping, has steadily increased among Americans to nearly 5.9 hours/day (1), and only 24% of American adults meet the physical activity guidelines for combined aerobic and strength training (2). Structured exercise (e.g., a 30-minute run) is just one facet of energy expenditure. Other sources of EE include non-exercise activity thermogenesis (NEAT). This includes lifestyle physical activity (PA, e.g., walking to a train station) and spontaneous physical activity (SPA, e.g., standing up, getting a glass of water, fidgeting, etc. (3). Both sets of behaviors vary widely across the day and between days, are not necessarily synchronous and, in fact, they can be demonstrated simultaneously (4-6). Unfortunately, current models of health behavior are insufficient to explain and predict the complexity of human movement and energy expenditure as they focus on habitual activity and trait-like motives without consideration for variations in motivation from moment to moment (7-10). There has also been criticism that decades of research focused on cognitive aspects of physical activity behavior have overshadowed constructs of emotion and motivation, despite the low predictability of such factors (11, 12). Improvements have recently been made in modelling physically active behaviors, as with the Affective-Reflective Theory (ART) of physical activity and sedentarism (13), the dual process model from Conroy and Berry (14) and the Affective Health Behavior Framework (AHBF) (15). These theories incorporate the influences of affect, cognitive deliberation, hedonic motivation, and the idea of an action impulse – a motivational endpoint that instigates both active and sedentary behaviors.

In addition, common to these and other models is the idea of subjective wanting or desiring to move and rest, also known as motivation states (16). For instance, there are times when people may want to get up and stretch their legs, exercise, or go for a walk. Likewise, they may desire to sit on the couch, take a nap, or lay down in bed. In this case, “desire” and “want” are used interchangeably, as has been done by other researchers (17), but they can also be used separately to denote influence from reflective or appetitive systems (11). These motivation states may be experienced as urges and cravings, conspicuously incorporating the idea of felt tension and may be experienced as positive or negative. Collectively, desires, wants, urges and cravings are known as affectively-charged motivation states (ACMS) (18). These occur in both healthy individuals, where they may often go unnoticed, and also in clinical populations, where they can be quite bothersome and even disabling (19). The basis of these states could be a basic drive to move and be active, which initially Feige (20) and more recently others (16) recognized as the foundation of physical activity motivation. The recognition of ACMS could significantly enhance our theoretical models as they: 1) apply to any rewarding behavior, 2) can change from moment to moment, and 3) incorporate aspects of affective response (15, 21). Over the last few years, Stults-Kolehmainen and colleagues (16, 19, 22, 23) have developed the idea of motivation states for movement and rest in the first effort to incorporate these ideas into behavioral models.

To understand how desires and urges for movement and sedentarism interact, Stults-Kolehmainen and colleagues (16) developed the WANT model (Wants and Aversions for Neuromuscular Tasks). This heuristic is a circumplex-type framework that incorporates three main factors (i.e., move and rest; want and lack of want; approach and withdrawal). A complete set of postulates of the WANT model include:

1. Humans have desires to move and rest.
2. Desires for movement and rest are characterized as two separate systems, and not opposite sides of the same axis.
3. There is both approach and avoidance motivation for movement and rest (e.g., one might be actively dis-wanting to move) (7, 21, 24).

4. These desires vary in strength or intensity (25) from very weak to nearly unavoidable/maximal, where they might be felt as an urge or craving.
5. Wants/desires are highly transitory as they are psychological states.
6. They change based on previous behaviors (i.e., the provision or avoidance of certain physical stimuli, such as exercise).
7. They interact asynchronously (e.g., one may be high in both, low in both, or anywhere in-between).
8. There may also be a total lack of desire, as in meditative or sleeping states, or perhaps total apathy or indifference.
9. They differ from psychosomatic sensations, such as energy and fatigue.
10. They differ from emotions; however, the experience of desire for movement and rest might vary systematically with certain emotions (e.g., stress responses, fight, flight, fright, freeze), situations (e.g., sporting event, sudden terror) and conditions (e.g., illness) (21).

The WANT model is influenced by theories mentioned above, but perhaps most concordant with the concept of motivation control systems from Frijda and colleagues (26-28), who articulated ideas of motivation states, strength of urges, wanting vs. not wanting, approach vs. withdraw, a center point of no desire (apathy, disinterest, indifference), and how these relate to emotion. Also related is the Elaborated Process Model of self-regulation by Inzlicht and colleagues (29), who describe opposing motivational systems of “exploration, leisure & want-to” versus “exploitation, labor & have-to”. Some researchers, however, have presented data and models that have been less supportive of our model. These have speculated that: 1) desires to move and be active have weak influences on physically active behaviors, 2) desire to move may be subservient to desires to rest and be sedentary, 3) avoidance motivation (e.g., dread of movement) rather than approach or want of movement, is most influential or 4) desires to be active may not exist at all (11, 15, 25, 30-32). Importantly, there appears to be a consistent logical fallacy from these sources and others that low exercise behavior and large waist lines observed across the population implies the erroneous conclusion that most people do not want to move (33, 34). Nevertheless, our recent work seems to dispute these assertions (22).

Our laboratory recently conducted a series of studies (22) to provide initial validation for the concept of affectively-charged motivation states (ACMS) for physical activity and sedentarism and the WANT model. We developed a tool to measure ACMS, called the CRAVE (Cravings for Rest and Volitional Energy Expenditure), and subsequently conducted factor analyses to analyze both “right now” and “past week” versions. One hundred and twenty-seven people from New England were then tracked over a two-year period, where it was determined that ACMS have properties more similar to states than traits. In a later study, 21 undergraduate students from Texas completed the CRAVE before and after a maximal treadmill test, where it was found that motivation states to move declined precipitously (Cohen’s $d_{av} = 1.05$) and to rest increased (Cohen’s $d_{av} = 0.82$). In a separate study, 41 students from the American Midwest were measured 3 times across a lecture period, where it was found that desires to move increased 20% just before class dismissal while desires to rest decreased 17%. In this last investigation, ACMS were moderately related to sensations of energy and fatigue. In line with expectations, these studies verified that motivation states are predicted by preceding behaviors. Overall, we can conclude that the concept of motivation states to be active and rest is valid and worthy of further exploration.

Despite the initial progress in developing and validating the concept of motivation states for physical activity and rest, many challenges need to be faced. First, there is still a dearth of evidence in the area, as noted by influential scientists in the area of exercise psychology (11). Second, the concept and model are still theoretical and lack ecological validation – the voice of opinion from non-scientists. That is to say, in

investigations up until this time, the concept has been largely limited to responses on an instrument in controlled settings, without greater naturalistic context. For instance, the way people describe motivation states in common language may not include the terms “desire”, “want”, “urge” or “craving”. Similarly, the WANT model needs further development and ecological validation as it may be missing important postulates that could be identified qualitatively. Conversely, important suppositions in the model (e.g., two axes, magnitude, approach vs withdrawal) may lack sufficient ecological validity. Further development is also needed as the WANT model is largely descriptive and explanatory without being predictive. In this regard, A) there is a lack of evidence to show a strong connection between ACMS and future behavior, and B) there are currently no adequate predictive models that incorporate desires and wants to move and rest. Qualitative research can fill that gap, using insights from participants to identify mechanisms for theory and conceptual model development (35).

Consequently, to further develop and validate the concept of motivation states and the WANT model, there are five aims of the current investigation.

1. To extend the quantitative validation of: a) the CRAVE scale, b) the concept (that people do have wants and desires), and c) the WANT model.
2. To further validate qualitatively the concept of affectively-charged motivation states (ACMS) for movement and rest; to uncover if respondents recognize these states in their own personal experience and how they might be described in layman’s terms.
3. To further validate qualitatively postulates of the WANT model.
4. To understand if ACMS relate to and spur physically active and sedentary behavior.
5. To generate information and themes to further develop the concept of motivation states and the WANT model and/or develop stronger predictor models of behavior.

Aims 2-4 will use a qualitative deductive approach and aim 5 will use a qualitative inductive approach.

Regarding quantitative data and deductive analysis, we hypothesized that:

- 1) motivation states (assessment via the CRAVE scale) would change over the course of an interview period (pre to post).
- 2) qualitative evidence would emerge from interviews to support: a) the ACMS concept and b) postulates of the model.
- 3) qualitative evidence that ACMS are linked to future physically active and sedentary behavior.

MATERIALS AND METHODS

Experimental approach

To address the aims and hypotheses of this study, we chose a mixed methods approach combining qualitative and quantitative methods. Participants were interviewed in focus groups (described below) with quantitative measures collected before and after the interviews.

Participants

Participants were 17 college undergraduate students (mean $\pm$ SD: age = 18.6 $\pm$.94; BMI = 26.1 $\pm$ 6.5; 7 people of color; 12 first-year students) enrolled in the Honors Program at the university. We queried about gender and not biological sex. There were 13 women, 2 men, 2 individuals identifying as non-binary. Participants were largely recruited in-person during classes by word of mouth with a script by one of the principal investigators (TG). Participants received a \$30 gift card for participation.

Procedure

The interviews took place in-person, in a private setting on the university campus, in one of seven focus groups that incorporated one to four participants at a time. Before commencement of the interviews, participants were briefed on the study purpose – the goal of better understanding the determinants of movement behaviors in humans, such as the urge to be active. Procedures, potential risks, and requirements for participation were discussed with all participants. They completed a consent form indicating their willingness to participate and have the interview digitally recorded. Upon completion of the informed consent participants filled out a short demographic questionnaire and CRAVE questionnaires (Past Week and Right now versions). Following the completion of these questionnaires, participants engaged in a focus group qualitative interview that presented 12 structured questions (Supplement 1). A researcher with extensive experience in qualitative research (TG) conducted the focus groups. Finally, participants ended by completing the CRAVE (Right now format) questionnaire one last time. Interviews were recorded by the interviewer and transcribed by a professional scribe.

Interview questions

Questions were structured to be balanced between move and rest (i.e., 4 specific to activity, 4 specific to rest, 4 for both move and rest). The first 4 questions were created with the idea of validation of the concept and model. Questions 5-12 were created with the idea of conceptual and model development. Questions were always presented in the same order, with questions 1 and 2 intended to prime participants for later questions. The interview responses were free flowing in that the same person did not always respond first. Once the interviewer finished posing the question, the first person who wished to comment was allowed to do so; however, each person had a chance to respond to every question. Participants typically engaged in a discussion format regarding their feelings, perceptions and observations related to the topics at hand. When necessary and to facilitate greater discussion, probes were used by the researcher to elicit more detailed responses.

Quantitative measure

CRAVE (Cravings for Rest and Volitional Energy Expenditure): The CRAVE is 13-item questionnaire with two versions, a “past week” version and a “right now” version, which has been validated across five studies (22), demonstrating excellent psychometric properties. For this study, the past week version was used just at the beginning and the right now version was used both pre and post. Six scale items relate to physical activity (e.g., “move my body”), and 7 items are related to sedentary behaviors (e.g., “do nothing active”). In validation testing, an exploratory structural equation model (ESEM) revealed that 10 items should be retained, loading onto two factors (5 each for Move and Rest). Consequently, the remaining 3 items are unscored fillers. Move and Rest factors are correlated moderately and inversely ($r = -0.71$ and -0.78 , in two different studies). Reliability of the scale in the same studies, as determined by McDonald’s ω , was very high (both .97). The CRAVE has good test-retest reliability and reliably measures state-like properties of motivation. Across-session interclass correlations (ICC) for Move (ICC = 0.72–0.95) and Rest (ICC = 0.69–0.88) are higher than those measured across 24-months (Move: ICC = 0.53; Rest: ICC = 0.49). The CRAVE is sensitive to changes with exercise testing, with Move decreasing with a maximal stress test (Cohen’s $d_{av} = 1.05$) and Rest increasing (Cohen’s $d_{av} = 0.82$). It has small to moderate associations with sensations of energy, fatigue, tiredness, and deactivation.

Data analysis

Quantitative data was analyzed with paired t-tests with the Jamovi statistical package (Jamovi Version 2.2) (36). For qualitative data, researchers used content analysis as described by Hsieh & Shannon (37) and formerly utilized by one of the first authors (38) to analyze results. A deductive approach was used for theoretical validation - to identify support or disagreement with both: A) the concept of ACMS for movement and rest and B) the WANT Model. An inductive approach was used for concept development.

These approaches were conducted simultaneously for efficiency. Two analysts, both experts in the content area (TG and MSK), started by identifying lower order themes, which were entered into Microsoft Excel. Associated data from interviewees was tagged to lower order themes. For the inductive approach, analysts independently inspected LOTs to generate higher order themes (HOTs) and tag each LOT with a HOT. HOTs were sorted into a reduced number of bins to create super-higher order themes (SHOTs). In creating SHOTs, additional theory was considered, such as the Elaborated Process Model of self-regulation (29), motivation control systems (26-28), Self-Determination Theory (39), the Incentive Sensitization Model (ISM) of rewarding behaviors (40, 41) and the Theory of Hedonic Motivation (11). In the case of disagreement in the creation of HOTs and SHOTs, a third author (NSB) provided the tiebreaker.

RESULTS

Quantitative analysis

CRAVE-Move was rated higher than CRAVE-Rest for both pre ($p = .022$, Cohen's $d = 0.61$) and post ($p < .001$, Cohen's $d = 1.48$). PW and RN versions of CRAVE-Move were moderately correlated ($r = .51$, $p < .05$). Respondents rated their CRAVE-Move as being higher “over the past week” than “right now” (33.7 ± 8.0 vs. 28.9 ± 9.8). PW and RN versions of CRAVE-Rest were also moderately associated ($r = .49$, $p < .05$). We did not reject the null hypothesis that there was no difference for rest “over the past week” vs “right now” (16.5 ± 7.6 vs. 17.3 ± 10.9). See Table 1.

Place Table 1 about here.

CRAVE-Move (right now) significantly increased across the interviews from 28.9 (SD = 9.8) to 35.3 (8.9) ($p = .006$, Cohen's $d = -0.76$). CRAVE-Rest demonstrated a trend to decline: 17.3 (SD = 10.9) to 11.9 (8.3) ($p = .057$, Cohen's $d = 0.50$). Variance decreased meaningfully, as seen in Table 2 and Figure 1.

Place Table 2 about here.

Place Figure 1 about here.

Deductive Qualitative Analyses

Evidence for motivation states

Thematic findings from these qualitative interviews, specifically Questions 3, 4 and 12 (presented later), corroborated the concept of ACSM for movement and rest. In question 3 (“Do you want to move right now?”), 12 reported “Yes” and indicated some desire to move; 5 indicated “No”. Of these, some respondents qualified their answer by noting they only wanted to move at a low intensity ($n = 2$), and 1 “No” was emphatic. In Question 4, 12 respondents reported that they did not want to rest; 4 responded they wanted to rest, and 1 did not know. Of these, 1 person noticed a conflict between wanting to move and rest. Two respondents noted they wanted to rest “a lot”, and 1 respondent noted she/he did not want to rest “at all”.

Throughout the focus group sessions, participants remarked frequently about their desires to move, be active but also to rest, both over the past week (e.g., “I have been wanting to move around a lot”) and right now (during the interview, e.g., “I want to get out and train”). Interviewees also provided evidence of aversions or avoidance of both movement and rest. While many of these statements were unambiguous, others were suggestive but less concrete, (“I am feeling like I wish we were doing a bit more [exercise]”). Table 3 provides a compilation of statement supportive of the concepts of affectively-charged motivation states.

There was also some doubt on the desire or want to move. For instance, one respondent said,

"... when it comes to 'urge' and 'crave' it's a natural thing [where] you crave sleep because you can't really just stay up all the time - because you need to sleep. It's more primal, I guess. Because everyone has to sleep. You don't have to move. Well, I guess it depends. There are people who don't really move. But there are some people that do. But everyone sleeps, no matter how active you are." (9/15, A).

There was even some doubt on the desire or urge to rest, "I don't see an urgency necessarily to rest, because I gotta reach that brink of exhaustion, to feel that I have earned the right to rest. ... I don't feel an urgency to rest." (9/27, A). Also, "Do I want to rest physically? I don't know, but I am ok with being active because my I feel like my brain needs a rest" (8/31, D).

Place Table 3 about here.

Changes in motivation states from pre- to post-interview

Question 12 revealed that at the end of the interview, 12 participants declared a greater desire to move, and two had no perceived changes in desires to move. Of the three remaining, they reported increased awareness of affectively-charged desires for movement and rest behaviors, which was corroborated by two other participants. One participant noted how this awareness also related to behavior,

"I think I get urges to move because I always have a twitch going on, and I'll move my legs a lot, like I am doing it now. They are always moving. And if I notice it happening more, I feel like "Okay, I need to get up and walk around", even if it just while I am listening to a class online. ... I have to do something!" (9/21, C)

One of the participants who reported no change in movement desires contrasted that with a report of a decrease in rest. One respondent reported, "Interestingly enough, I think I've actually woken up in the hour that I've been here..." (9/17, A).

Support for the WANT model

Respondents' comments provided supporting evidence for all postulates of the WANT model. One postulate, "Desires to move and rest interact asynchronously (e.g., one may be high in both or low in both or anywhere in-between)", had the least amount of evidence. For this tenet, a respondent did note in regard to a stressful situation,

"I was a bit hungover, and I was stuck to my bed because I was a bit nauseous but, I [couldn't] fall asleep. [I thought] "If you can't rest, you should be doing something", and, it was very, annoying because I wanted to begin, cleaning my room, "I'm awake, I should be moving", but I needed my eyes to be closed and a pillow over my head, I couldn't satisfy the urge to move and get stuff done, and that was very stressful." (9/27, A)

There was some evidence against specific postulates of the WANT model. For instance, concerning the supposition that "Desires vary in strength from very weak to nearly unavoidable/maximal", a interviewee remarked,

"I would say that the want, desire and urge - the whole set - feels the same to me." "They are not super different. I don't think." (8/31, B)

See Table 4.

Place Table 4 about here.

Impact of Affectively-Charged Motivation States (ACMS) on subsequent behavior

We found qualitative evidence that motivation states were related to aspects of subsequent movement and sedentary behavior - in type, quantity and in quality of motor behaviors. The effect on behavior was often related to the strength of the ACMS. One participant stated, "If I really want to exercise, I will make time for it." (9/10, B). Respondents also reported that motivation states did not result in behavior enactment / consummation. For instance,

" 'Want' is more knowing I should, but it doesn't incite me to actually do it. Want is just, 'I should probably do this, because I know it's good for me', but I don't actually do it." (8/31, D)

See Table 5.

Place Table 5 about here.

Qualitative Inductive Analyses

Lower-Order Theme (LOT) Identification

Investigators found 435 lower-order themes (e.g., "move for sport", "rest and be lazy"), only 25 of which were identical between raters, resulting in 410 unique lower order themes. LOTs generated per question ranged from 16 for Question 12 to 65 for Question 7 (mean = 36.3, SD = 12.4). There was a total of 753 counts (e.g., instances or tags) across all LOTs. Counts (e.g., instances or tags) per LOT identified was 1.7 (range 1.1 to 3.0). In the first 8 questions, move queries resulted in 180 LOTs and rest resulted in 145, but total counts from move queries was 285 and from rest was 264. Overall, these data demonstrate many lower order themes were identified (for both move and rest factors) and tagged to participant's comments.

Higher-Order Theme (HOT) Identification

The two analysts generated the same (or highly similar) higher-order themes only 22.4% of the time. Disagreed HOTs were sent to analyst 3, who chose analyst 1's HOT in 33.6% of instances. In 1.3% of instances, the analyst was unable to make a determination, resulting in the items being discussed until consensus. In the end, 43 higher order themes were agreed upon.

The 10 most common HOTs (based on frequency of LOTs in each HOT) were: 1) "sensations/stimulation" (n = 62 LOTs), 2) "demands" (n = 52), 3) "facilitators of movement" (n = 40), 4) (tie) Theoretical support (n = 37), 4) (tie) "physical sensations" (n = 37), 6) "cycles/variation" (n = 35), 7) (tie) "stress" (n = 32), 7) (tie) "exhaustion threshold" (n = 32), 7) (tie) "deprivation/satiation" (n = 32) and 10) "barriers for movement" (n = 31).

Super Higher-Order Theme (SHOT) Identification

From the 43 HOTs, super higher order themes (SHOTs) were created. Analyst 1 sorted the 43 themes in 10 clusters, which included: 1) Stable change / biorhythms, 2) Factors affecting change in motivation states, 3) Processes of control, 4) Impulse control / Impulsivity, 5) Objective oriented, 6) Moderators, 7) Sensations, 8) Strength of motivation states, 9) Theoretical postulations, and 10) Stress factors. Analyst 2 sorted the HOTs into three SHOTs: 1) theoretical support, 2) behavioral processes, and 3) stress. Through a process of consensus, six were designated: 1) “people experience movement urges”, 2) “change”, 3) “autonomy”, 4) “objective-orientation”, 5) “moderators”, and 6) “stress effects”. These were then presented collectively at an international conference, and feedback was garnered.

We decided to present the themes as dualities based on the contrasting ideas of: 1) “propelling versus restraining” forces, 2) “automaticity versus deliberation” in the Affective-Reflective Theory of Physical Activity (13) and 3) volitional versus appetitive desires (11, 17). To be consistent with the WANT Model, however (16, 19, 22), we decided to present these dualities as additive (“and”) and not necessarily as a conflicting binary (“versus”). This was also done to emphasize the potential for adaptive and flexible behavioral repertoire (42), as with the WANT Model (i.e., which includes move and rest, and not move versus rest), where combinations of desires can lead to more diverse behavioral outcomes (42). The final SHOTs were: 1) Want - and do not want (diswants), 2) Change and stability, 3) Autonomy and automaticity, 4) Objectives and impulses, 5) Restraining and propelling forces, 6) Stress and boredom. Each SHOT is explained in detail below. See Figure 2.

Place Figure 2 about here.

SHOT 1 - Wants and diswants (aversions)

All of the higher order themes in this SHOT related to affectively-charged motivation states and their characteristics. Thus, the SHOT was called “Wants and diswants”. This SHOT had six higher order themes: 1) sensations / stimulation (i.e., people feel wants to move and rest), 2) theoretical support for ACMS and the WANT model, 3) tension strength of motivation states, 4) aversions / dread for movement and rest, 5) intrinsic motivation and 6) thresholds differentiating ACMS. Supplement 2 contains the HOTs, exemplar LOTs and quotes for the “wants and diswants” super higher order theme.

SHOT 2 – Change and stability

The higher order themes in this SHOT all related to factors changing or remaining stable over time, which invokes concepts of biorhythms and regulated change, and perhaps similar to homeostasis and allostasis (43). This SHOT had seven higher order themes: 1) cycles and variation, 2) homeostasis, 3) inertia and momentum, 4) balance of movement and rest, 5) habits and routine, 6) traits and 7) aging and the life course. Supplement 3 contains the HOTs, exemplar LOTs and quotes for the “change and stability” super higher order theme.

SHOT 3 - Autonomy and automaticity

Close inspection of the HOTs, it was determined to call this SHOT “autonomy and automaticity”, in respect to processes of control and higher-order cognitive processes, such as decision-making. Both HOTs and LOTs in this theme appear to point to many user-generated decisions (or at the very least) the inability to make decisions (44). In other words, some processes have a locus of control generated consciously by the self, while others are generated more unconsciously. Considering the framework of Self-Determination Theory (39, 45), the notion of autonomy is a feeling that one has choice and is willingly endorsing one’s own behavior (44). Autonomy here makes sense as individuals might think about actions (e.g., cognitive processes), regulate behavior (e.g., energy management) and must overcome urges to produce a desired behavior (e.g., temptation versus will power). When looking through this lens, autonomy appears as the

concept that encompasses all these lower order themes. In contrast, for those decisions that appear to not to consciously generated, the idea of automaticity from Affective-Reflective Theory (13). Recent work suggests that automaticity and autonomy interact to produce stronger physical activity behaviors (46). This SHOT had seven higher order themes: 1) automatic processes, 2) cognitive processes, 3) behavioral regulation, 4) anticipation/energy management, 5) cues / triggers / feedback, 6) willpower / self-control, and 7) consummation / behavioral enactment. Supplement 4 contains the HOTs, exemplar LOTs and quotes for the “autonomy and automaticity” super higher order theme.

SHOT 4 - Objectives and impulses

This SHOT was named “objectives and impulses” to reflect that some targets are rationale while others are appetitive, which is in line with the theory of desires from Davis (11, 17). Examining the lower and higher order themes of this SHOT, and the quotes associated with them, it was apparent that the respondent was trying to reconcile commitments against impulses to accomplish an objective. This would be balancing conflict, setting, and working toward goals, or thinking about what one has to do, needs to do, should do, or must do based on the desired end result. Taken together, this reads as an objective-oriented mindset contrasting against an impulsive mindset, where one is actively working towards a desired outcome. This SHOT had 7 higher order themes: 1) goals, 2) drive, 3) have to/need to/should/must, 4) instrumental demands, 5) conflict, 6) secondary desires, and 7) temptation. Supplement 5 contains the HOTs, exemplar LOTs and quotes for the “objectives and impulses” super higher order theme.

SHOT 5 - Propelling and restraining forces

Respondents indicated that there were several factors that modified or moderated their experience of motivation states to affect activity and sedentary behaviors. Thus, it was decided to name this “propelling and restraining forces”, in alignment with Affective Reflective Theory (ART) of physical activity and sedentarism (13). This SHOT had eight higher order themes: 1) facilitators of movement, 2) deprivation / satiation, 3) barriers for movement, 4) social influences, 5) conditions, 6) liking (pleasure) / reinforcement (reward), 7) immersion, and 8) distraction. Supplement 6 contains the HOTs, exemplar LOTs and quotes for the “propelling and restraining forces” super higher order theme.

SHOT 6 - Stress and boredom

Respondents frequently noted that desires to move and rest were instigated by states of over- and under-stimulation – strain and monotony. This makes sense, as psychological stress states can have a strong effect on physically activity and sedentarism (47), both inhibiting and activating behavior, perhaps by affecting psychosomatic sensations (48). Stress and boredom were encompassed of 8 higher order themes: 1) impinging life demands, 2) physical sensations, such as energy and fatigue, 3) stress, 4) exhaustion threshold, 5) monotony and boredom, 6) emotional regulation, 7) mood and emotion, and 8) dysfunction and dysregulation. Supplement 7 contains the HOTs, exemplar LOTs and quotes for the “stress and boredom” super higher order theme.

DISCUSSION

This is the first mixed-methods study (qualitative and quantitative) to provide evidence that individuals experience appetitive and reflective wants or desires to move and rest; that these states change rapidly and are highly influenced by a number of ever-changing factors, such as the daily experience of stress (47). Interviews with 17 college honors students revealed that they experienced affectively-charged motivation states (ACMS) to move and rest both in recent weeks and in the present moment. They also

provided evidence for other postulates of the WANT model, such as not wanting to move or rest at all, or rather, *actively avoiding* certain behaviors. In a few cases, respondents provided contrasting perspectives that contradicted expectations. For instance, some respondents expressed some doubt that they had any desire to move, or that there were any differences between various motivation states, such as the desire to move versus an urge to move. Importantly, some evidence, though not extensive, supported the idea that motivation states to move and rest spur actual activity behaviors in a time frame proximal to the experience of the subjective desire. To understand how motivation states might impact behavior, we conducted an inductive content analysis of the interviews. Forty-three higher order themes were found, which we separated into 6 super-higher order themes, such as “objectives and impulses”, “propelling and restraining forces” and “stress and boredom”. The study also provided further validation of the CRAVE scale, which was recently developed to measure motivation states (22). As measured with this instrument, there were changes in ACMS from pre- to post-interview with moderate effect sizes (.76 and .5, for move and rest, respectively). Overall, there was an abundance of support, but also some minor conflicting evidence, for the concept of affectively-charged motivation states for physical activity and sedentarism and their influence on subsequent behaviors.

Evidence of affectively-charged motivation states - Quantitative and qualitative deductive analyses

The major priority of this study was to determine if a group of respondents would qualitatively support or negate the idea of being motivated, in the present moment, to move, be active and exercise. This has come into focus given a preponderance of opinion, and some empirical data, that humans prefer to be sedentary, or may not have any experience of desiring or wanting movement (31, 32). While there is a strong rationale that humans do want to move (16) and initial quantitative data exists to support it (22), we were interested in opinions from interviewees and their expressions of desire (or lack thereof) in their own words. As it happened, participants largely corroborated the concept of motivation states, but they also presented unique perspectives. Participants stated that they did subjectively experience desires to move and rest, including at the time of the interview, which sometimes differed from desires experienced over the past week. Moreover, these states were volatile, rapidly dissipating or succumbing to other desires. They also described a total absence of desire, often during flow states, or even aversion to movement and rest; in other words, actively avoiding these behaviors. Desires were sometimes described as being consummatory (e.g., as in feeling an urge to exercise that instigates actions to go work out at the gym), which in turn often resulted in satiation – a fulfillment of desire leading to a drop in the motivation state and subsequent cessation of activity. Of note, strong urges and cravings for movement, typically from conditions of deprivation (e.g., sudden decreases in exercise) were associated with physical and mental manifestations, such as leg stiffening, fidgeting, feelings of being antsy, jittery, and restless. Urges for rest and sleep featured prominently as well, and some respondents even expressed having extreme cravings for rest.

While qualitative data addressed the experience of motivation states, quantitative data mainly demonstrated variance in those states. As hypothesized, motivation states as assessed with the CRAVE scale changed significantly over the course of the focus groups. We observed that the desire to move increased pre- to post-interview, and the desire to rest decreased, which agrees with data previously collected from a study that saw similar trends over 3 time points throughout an educational seminar (22). Some participants described the experience of motivation states as something novel and unimaginable beforehand, but now that it was in their conscious awareness, it had some concreteness and veracity. The idea that we may or not be aware of our desires and impulses has been discussed extensively (26, 27), and the idea of arousing awareness for movement impulses was famously demonstrated by Benjamin Libet (49) in his studies on free will. Having satisfactorily analyzed the interviews for deductive evidence of motivation states, we turned to analyze the data from an inductive perspective, creating hierarchical

themes to understand how motivation states operate within a larger regulatory scheme. The first super higher-order theme, “wants and diswants (aversions)” was mostly constituted from the deductive information generated above.

Qualitative inductive analysis

Do motivation states matter in the control of behavior, and if so, how? Desires and urges for movement and rest are ostensibly antecedents to and consequences of behavior, but how they operate within behavioral systems is unknown. Super higher-order themes two through five commonly related to ideas of behavior regulation, comprising the categories of: SHOT 2) Change and stability, SHOT 3) Autonomy and automaticity, SHOT 4) Objectives and impulses, and SHOT 5) Restraining and propelling forces. In regard to the SHOT on change and stability, participants widely reported diurnal, weekly and seasonal variation in desires for movement and rest. A plethora of data exists in the area of circadian rhythms, supporting the notion that pertinent hormones (e.g., cortisol) (50), neural peptides (e.g., hypocretin-1 / orexin A) (51) psychological factors (e.g., perceptions of energy and fatigue) and other attributes vary cyclically over the course of a day, month, year or longer (21). Another theme emerging from this SHOT was that of behavioral and motivational momentum and inertia (e.g., being “in a rut” or “stuck”) (14), perhaps similar to the idea of affective inertia (52), which are associated with symptoms of depression or attention disorders (53). This is intriguing as one might speculate that motivational inertia serves as another indicator of psychological dysfunction. On the other hand, the feeling of inertia may be a key difference between types of ACMS, with cravings and urges having more motivational pull through inertia or stickiness. Clearly though, sometimes inertia is less pernicious and simply due to forces of habit and simple environmental demands. Participants indicated that habit drove their behavior without awareness a desire for movement, attesting to the power of habits (54, 55). Another force (perhaps equally strong to habit) indicated by respondents was provided by movement’s instrumental or utilitarian value. In short, people still have some physical tasks that can only be accomplished through movement, and motivation states match those situational demands, what Brehm and Self (25) call “motivational arousal”.

These concepts segue easily into SHOT 3 (Autonomy and automaticity), and of these two contrasting perspectives, perhaps automatic processes of regulation were most frequently described by participants; they did represent the greatest number of lower-order themes in this SHOT. Central to automatic processes are the related ideas of randomness, and spontaneity, which recently have been highlighted in motivation research but are rarely accounted for in analyses (56). “Motivation arrives as opposed to being planned” (56), indicating the non-linear path of motivation. Participants were clear that a variety of external variables, such as cues, were antecedents of movement and rest, perhaps accounting for this variability (14). Finally, the theme of automaticity is also consistent with terminology used in the social psychology work on conscious versus nonconscious processing and decision-making. Hallmark research from Bargh (57) resulted in the adoption of *automaticity versus control* to refer to non-conscious and conscious processes. In the current case, autonomy and control are synonymous.

In line with the Affective – Reflective Theory of Physical Inactivity and Exercise (13), participants also described, though less frequently, deliberative processes, such as decision making, planning, energy management and prioritization of rest and exercise. Motivation states are key mediators in adaptive planning (42). As seen in SHOT 4, participants described desire changing in the context of conflict, which existed between competing desires as well as between desires and goals. Participants expressed these as contrasts between “want to”, “have to”, “should”, “need to” and their converses (“don’t want to”, “shouldn’t”, etc), many or most of which interacted with goals, intensions and other cognitive factors to spur change (16, 58-60). Saunders and colleagues (61) found that, on average, 60% of participants’ desires conflicted with at least one goal. The interplay between these forces were often influenced by willpower

(resistance), self-control, or harmonization of desires to result in behavioral enactment or avoidance. Greater resistance or willpower applied immediately in the moment of temptation results in less enactment of unproductive desires (61, 62). While a lack of willpower might be the key factor in some situations, in others it might more simply be a lack of opportunity to move or be sedentary in the moment of experiencing desire. Sometimes respondents indicated that desires were manipulated or ignored, but frequently urges and cravings were strong enough to hijack attention and thoughts, consuming physical and mental experiences to the point of not being able to overcome them, ostensibly resulting in rapid behavior (58, 63). On the other hand, as laid out in SHOT 5, there were a variety of barriers blocking consummation of the desire to move, such as injury, exhaustion, and responsibilities. There were also a variety of conditions (e.g., having free time for leisure, being in proximity to a gym or nature) and social factors facilitating desires leading to opportunities to act on the impulse (10, 44, 64). Taken together, motivation states appear to play a prominent role in behavioral processes. More specifically, they seem to relate clearly to the concept of self-regulation, which is defined as “any effort to actively control behavior by inhibiting dominant and automatic behaviors, urges, emotions or desires, and replacing those with goal-directed responses” (65, 66).

Stress and boredom

Psychological stress, both subjective and objective, emerged as a major theme, and participants frequently cited facets of stress as abating and/or instigating motivation states to move (e.g., “Stress makes me want to move.”) and rest (e.g., “My desire to rest is normally about stress.”). Stressful emotions (e.g., “freaking out”, being overwhelmed), life stressors (e.g., transition to college, COVID-19, family death), demands (e.g., schoolwork, sports training), daily hassles and work/rest imbalance were all regarded as influential in either activating or inhibiting motivation and behavior. Several participants stated that they utilized exercise as a method to cope and regulate emotions, which may explain why some people move more in the face of stress. All of these observations fall in line with a classic systematic review that found that psychological stress was associated with inhibited physically active behaviors in 86% of higher-quality studies, but 18% of prospective studies found that it was associated with activated movement well (47). Investigations including sophisticated analyses have demonstrated that the effects of negative affect on physical activity are stronger than the opposite direction (67, 68). Stults-Kolehmainen, Blacutt & Filgueiras (69) found that individuals reporting very high levels of stress reported either no exercise at all, or alternatively, very high levels of exercise (e.g., working out 6 days a week). Despite facing extraordinary stressors, some athletes are able to self-regulate to maintain effortful behaviors by focusing on goals, the so-called “self-regulatory efficacy” (70), resulting in a null effect of stress. Back to the current data, excitement and eustress typically were related to an increased drive to move, but so was a lack of stress and under-stimulation – feelings of boredom and monotony. Interestingly, stress also resulted in feelings of numbness or being frozen, in other words, not wanting to move or rest at all, which is in accordance with postulates of the WANT model (16). One unique observation was that not being able to satisfy or consummate an urge or craving to move or rest sometimes resulted in the experience of stress, frustration, and agitation, indicating possible bidirectional effects (e.g., “I couldn’t satisfy the urge to move and get stuff done, and that was very stressful”). Overall, it appears that stress and emotion interact with motivation states (e.g., desire, urge, craving) to move and rest in a highly complicated manner to influence behavior (71). Unfortunately, at the current time there is a lack of a clear model to explain stress and motivation interactions - whether motivation mediates or moderates the effects of stress on physical activity.

Aside from psychological stress, other mental health and psychological considerations had sway over motivation states. For instance, psychosomatic sensations, such as tiredness, pain and soreness all had a clear impact on desires to move and rest, with aversive sensations typically extinguishing the desire to

move and propelling desires to be sedentary. Both good and poor mood were commonly cited as influencing desires to move, be productive and rest. Although unprompted, some respondents openly commented that they had various mental health conditions, such as anxiety, ADHD, bipolar disorder, and body image problems. These respondents spoke about episodes of impaired activity - being “in a rut”, feeling “stuck” or, conversely, being hyperactive and feeling manic (72). However, no participant discussed depression and trauma. Those with PTSD, for instance, sometimes complain of being “frozen” and unable to move and be productive (73), while those with panic attack and agoraphobia suffer from “fear responses to acute threat with the urge for active avoidance/escape” (74). Stults-Kolehmainen and colleagues have discussed aspects of motivation states as they appear in psychological disorders, including, anorexia nervosa, muscle dysmorphia, akathisia, restless legs syndrome and others (19). Until recently, these sensations appeared to be obscure and idiopathic symptoms, but recently NIMH has classified these in the *sensorimotor domain* under the construct “motor actions” (sub-construct: “sensorimotor dynamics”) (75), which seems to validate the notion that ACMS might have a place in mental health and pathology. Unfortunately, this study included a sample that was too small to explore any of these ideas, and we did not include any physical or mental health measures in this study.

Limitations

The results of the current investigation must be interpreted with some caution due to several limiting factors. First, the number of participants was small and was composed mostly of female undergraduate honors students. Previous studies have found no differences between genders for motivation states (22), so lack of variability in gender may not be an issue, but we have observed differences by age (22). Older individuals have a much wider range of life experiences and are subject to the effects of both primary and secondary physical aging (76). Consequently, it seems likely that older adults will experience motivation states for movement differently and will likely have a greater desire for rest. Comments from our respondents could also reflect a specific motivational climate, culture and education around movement and rest that might be tied to this population of high achieving college students (44, 64, 77). Indeed, our previous work also demonstrates that adults of different age groups have different motives for exercise (9). Motivation states also vary by exercise stage-of-change, a proxy for physical activity behavior (22). The fitness and physical activity levels of the sample were not measured but based on their extensive comments it is certain that this group was a healthy, active, and high functioning sample. This is important, as for some people, there are likely trait manifestations of wanting to move and rest. Given all these potential factors, the interviews generated over 400 lower-ordered themes, indicating that even though the participant number was low, the interviews were very productive. Also, despite the low *n*, we observed changes in CRAVE scores across the focus groups, indicating increased desires to move. There was no control group, therefore, we don’t know if changes in CRAVE (“right now”) were due to: 1) increased awareness of normally unconscious desires, resulting from talking about physical activity and rest behaviors (49), 2) the effects of behavioral priming, which Bargh demonstrated clearly impacts physical activity (57), because participants felt “cooped up” during the interview, 3) because of anticipation of leaving the venue for their next daily task or, 5) demands effects, 6) reactivity to the CRAVE scale, or 7) some other unknown factor. The first factor might be discounted as we did not observe concomitant increases in the desire to rest (“right now”), even though it was also widely discussed. On the contrary, it was diminished. Furthermore, we observed similar results in Study 4 from Stults-Kolehmainen et al. (22), from a lecture period when physical activity and rest were not specifically discussed. Future studies will need to untangle these effects with better experimentation.

Future research

Future research could attempt to make the necessary methodological advances noted above, or it could go in alternative directions to address other issues, which are roughly divided into 4 research questions.

Are people naturally lazy?

First, while the current study provided both quantitative and qualitative evidence that desires to move and rest are subjectively felt in conscious awareness, and various aspects of the WANT model found support, we were not able to adequately address the idea of which desire (physical activity or sedentarism) is predominant in this group of respondents, nor in the larger scope of society. However, our quantitative data found that the desire to move was greater than the desire to rest at every time point. This is consistent with our previous investigations, where desire to move was consistently rated higher than desire to rest in quantitative analysis (22). It is also congruent the idea that, “The human body is built for physical activity, not rest” (78), implying that humans have both a natural need and inherent drive to move (discussed extensively in Stults-Kolehmainen et al. (16)). However, we did not specifically ask our interviewees questions to directly compare desires, such as, “Which desire do you feel more often?” or “Which desire is typically stronger for you?” Various researchers have suggested that humans are naturally inclined to rest and thus conserve energy; therefore, they likely have greater desire to be sedentary, are typically lazy, and only move when necessary (11, 25, 31, 32, 79). The ideas of laziness and productivity did feature among respondents in these focus groups, with laziness generally being viewed as the opposite of productivity, and desires to rest and move associated with those tendencies (e.g., “I feel urged to move and get stuff done.”). Future research should address whether the feeling of laziness is simply: A) a lack of a desire to move (regardless of the desire to rest), B) a combination of low desire to move and high desire to rest, or C) a low desire to move and a high desire to rest but felt in the shroud of “should” move.

How do “shoulds” and “want to’s” interact?

Following from above, a person may feel that they “should” be moving, and they “should” be productive, but they do not have the subjective and appetitive feeling of wanting to move and be productive. Future studies should address the ideas of “should” and “have to” in relation to “want to” - developing better instruments and theories to connect these related ideas. More practically, future studies might investigate how to create exercise routines that are more enjoyable, less compelled by “shoulds” or help people to move more mindfully, paying attention to desires and/or embracing desires to move and rest in balance, as with mindful walking or martial arts (80, 81). These might be conducted as part of just-in-time adaptive interventions (JITAI) (82), which attempt to gauge and take advantage of motivation states, but still to this time have not successfully incorporated this idea (83) as none have used a valid measure, such as a single-item CRAVE (22).

How can the WANT model be improved?

Future research should also focus on updating and revising the WANT model (16), which was created because of apparent theoretical deficits and the inability of existing theories to adequately explain the phenomena we have observed, but still falls sort of its intended goal. In short, the WANT model is a heuristic to understand how desires might vary in strength, approach and how they interact with each other. This effort is concordant with the NIMH Research Domain Initiative Criteria, which seeks to understand elements of psychological phenomena, such as urges and motor sensations (75). The current data provide evidence that facets of the WANT model (e.g., that desires may be oriented to approach or avoidance, are impacted by previous behaviors, etc.) are valid. However, the model as a whole lacks extensive quantitative validation, mainly because there are no measurement tools available to assess aversions (i.e., diswants) to move and rest. Until this measure exists, adequate validation of the dual-axis structure of desires for movement and rest (and thus four quadrants) is not feasible. The WANT model could be further explicated by considering how ACMS to move and rest fluctuate in tandem with other internal and external states (e.g., stress, satiety, deprivation, hunger, fatigue), emotion and other

influences that vary by the situation and context. For example, a revised WANT model might incorporate exogenous stimuli known to influence desires to move, such as music, light and other environmental factors identified by participants in these focus groups. Insights generated from qualitative data, as in the current study, is pertinent for the advancement of model, theory and intervention development in the areas of physical activity and sedentary behavior, as has been delineated by Bonell (35).

What other theories offer insight into motivation states for movement and sedentarism?

The WANT model is also not a predictive model; therefore, frameworks predictive of physical activity and sedentarism, such as dual-process theories (13, 14), or models of affective response (15) maybe be better suited to explain these phenomena or new research frameworks maybe be needed. Dissimilar from theories mentioned above, the Elaborated Process Model of self-regulation (29) focuses on the idea of depletion and how it moderates motivation. It asserts that people switch from move to rest (and from “have-to” to “want-to”) systems and back again as they become depleted in each system. Importantly, depletion is associated with fatigue, boredom, and negative emotions, which propels the individual to avoid exploitation types of tasks (i.e., work) and approach exploration types of tasks (e.g., watching video clips or television) or vice versa. While the switch is ostensibly prompted by fatigue, it may also be triggered by a (perhaps unconscious) cost/benefit analysis, stoking desires for rewarding stimuli and causing changes in attention, salience, and emotion. From an evolutionary aspect, such fatigue-induced switching is highly utilitarian and adaptive as it: A) prevents excessive focus on any one single desire, for instance, in the dysfunctional cases of punding (84), B) it also protects the human organism from overexertion and collapse (85, 86). However, the theory also postulates that to promote the continuation of valued behaviors, fatigue can be better tolerated and made less aversive with extra reward, distractions, affirming values, prayer or other strategies (29), all of which may be relevant in the promotion of physically active behaviors. Other models of depletion and satiation, such as the exercise satiation model (87) should be studied for ideas to expand and/or modify existing frameworks – together with Self-determination Theory (39, 45) and the Theory of Effort Minimization in Physical Activity (32).

Finally, future research should investigate whether people act on their desires to move and rest when these are experienced in the moment of tension. This may be studied in a naturalistic setting or in a laboratory environment where such desires are instigated.

Conclusion

Both quantitative and qualitative data support the notion that humans experience subjective feelings of wanting or desiring to move their bodies, be physically active and/or exercise, which we call affectively-charged motivation states (ACMS). Sometimes, these actionable feelings were described as strong, engrossing or even irresistible, as in an urge or craving to get up and walk around or engage in a workout or training session. Respondents clearly indicated having experiences of desire or craving to rest, sleep and engage in sedentary behaviors, and frequently these collided with ambitions to move or be productive. How interviewees described their subjective states largely fell in line with postulates of the WANT model (16), which describes how desires, wants, urges and cravings to move, be active and rest operate loosely and asynchronously. Motivation states to move and be sedentary varied by numerous factors, which we divided into six super higher-order themes. Perhaps the most prominent of these was the theme centered on stress. Indeed, the experience of stress frequently stymied desires to move and be active, though sometimes it had the opposite effect. Stress also stoked desires to rest and be sedentary, though again, sometimes it also diminished those. Quantitative data revealed that, across focus groups, desires to move increased, and desires to rest trended to decrease, which participants corroborated when specifically asked about perceived changes in motivation states. The overarching picture that emerged from this investigation was that motivation states (e.g., desires, wants, urges and cravings) potentially

play a prominent role in behavioral processes, interacting with other factors (e.g., stress, habit) to drive movement and sedentary activities. Such information may lead to better theories and, down the road, adaptive interventions to promote physical activity.

AUTHOR CONTRIBUTIONS

MSK and TAG conceptualized the project and designed the study. Data collection was conducted by TAG. MSK and TAG conducted the qualitative analyses, with support from NSB and FAB. PM and MSK conducted the quantitative analyses. The manuscript was written primarily by MSK and TAG, in that order. The manuscript was evaluated and refined by RS, JBB, DB, CB, GA, FAB, AH and JLB, in that order. All authors provided critical feedback, reviewed, and approved the final manuscript.

FUNDING

GA was supported by a fellowship from the Office of Academic Affiliations at the United States Veterans Health Administration, a Robert E. Leet and Clara Guthrie Patterson Trust Mentored Research Award, Bank of America, N.A., Trustee, and American Heart Association Grant #852679 (GA, 2021–2024).

DATA ACCESSIBILITY

Data is available upon reasonable request to the corresponding author.

ACKNOWLEDGEMENTS

These data were presented at the NASPSPA (North American Society for the Psychology of Sport and Physical Activity) annual conference in Kona, HI, United States, where many attendees, in particular Ralf Brand, Ph.D. (University of Potsdam, Germany), provided thoughtful comments that significantly improved this manuscript. Miguel Blacutt provided some assistance with data interpretation. The authors also wish to thank Alberto Filgueiras, Ph.D. (Rio de Janeiro State University, Brazil) and Cyrus Dadina (Dobbs Ferry High School, NY, United States) for miscellaneous research support. SciPod created a podcast to explain the concepts of affective-charged motivation states for physical activity and sedentarism in the context of the WANT model (23). This study has a preprint in SportRxiv.

REFERENCES

1. Ussery EN, Whitfield GP, Fulton JE, Galuska DA, Matthews CE, Katzmarzyk PT, et al. Trends in Self-Reported Sitting Time by Physical Activity Levels Among US Adults, NHANES 2007/2008–2017/2018. *Journal of Physical Activity and Health*. 2021;18(S1):S74-S83.
2. Hyde ET, Whitfield GP, Omura JD, Fulton JE, Carlson SA. Trends in Meeting the Physical Activity Guidelines: Muscle-Strengthening Alone and Combined With Aerobic Activity, United States, 1998–2018. *Journal of Physical Activity and Health*. 2021;18(S1):S37-S44.
3. Levine JA, Schleusner SJ, Jensen MD. Energy expenditure of nonexercise activity. *The American Journal of Clinical Nutrition*. 2000;72(6):1451-4.
4. Levine JA, Eberhardt NL, Jensen MD. Role of Nonexercise Activity Thermogenesis in Resistance to Fat Gain in Humans. *Science*. 1999;283(5399):212-4.
5. Thompson D, Batterham AM. Towards Integrated Physical Activity Profiling. *PLoS One*. 2013;8(2):9.
6. Rosenberger ME, Fulton JE, Buman MP, Troiano RP, Grandner MA, Buchner DM, et al. The 24-Hour Activity Cycle: A New Paradigm for Physical Activity. *Med Sci Sports Exerc*. 2019;51(3):454-64.
7. Lochbaum M, Jean-Noel J, Pinar C, Gilson T. A meta-analytic review of Elliot's (1999) Hierarchical Model of Approach and Avoidance Motivation in the sport, physical activity, and physical education literature. *Journal of Sport and Health Science*. 2017;6(1):68-80.

- 848 8. Rhodes RE, McEwan D, Rebar AL. Theories of physical activity behaviour change: A history and
849 synthesis of approaches. *Psychology of Sport and Exercise*. 2019;42:100-9.
- 850 9. Stults-Kolehmainen MA, Ciccolo JT, Bartholomew JB, Seifert J, Portman RS. Age and Gender-
851 related Changes in Exercise Motivation among Highly Active Individuals. *Athletic Insight*. 2013;5(1):45-
852 63.
- 853 10. Stults-Kolehmainen MA, Gilson TA, Abolt CJ. Feelings of acceptance and intimacy among
854 teammates predict motivation in intercollegiate sport. *Journal of Sport Behavior*. 2013;36(3).
- 855 11. Williams DM, Bohlen LC. Motivation for exercise: Reflective desire versus hedonic dread. *APA*
856 *handbook of sport and exercise psychology, volume 2: Exercise psychology, Vol 2. APA handbooks in*
857 *psychology series*. Washington, DC, US: American Psychological Association; 2019. p. 363-85.
- 858 12. Rhodes RE, Dickau L. Experimental evidence for the intention–behavior relationship in the
859 physical activity domain: A meta-analysis. *Health Psychology*. 2012;31(6):724-7.
- 860 13. Brand R, Ekkekakis P. Affective–Reflective Theory of physical inactivity and exercise. *German*
861 *Journal of Exercise and Sport Research*. 2018;48(1):48-58.
- 862 14. Conroy DE, Berry TR. Automatic Affective Evaluations of Physical Activity. *Exerc Sport Sci Rev*.
863 2017;45(4):230-7.
- 864 15. Williams DM, Rhodes RE, Conner MT. Conceptualizing and intervening on affective determinants
865 of health behaviour. *Psychology & Health*. 2019;34(11):1267-81.
- 866 16. Stults-Kolehmainen MA, Blacutt M, Bartholomew JB, Gilson TA, Ash GI, McKee PC, et al.
867 Motivation States for Physical Activity and Sedentary Behavior: Desire, Urge, Wanting, and Craving.
868 *Frontiers in Psychology*. 2020;11(3076).
- 869 17. Davis WA. The two senses of desire. *Philosophical Studies*. 1984;45(2):181-95.
- 870 18. Kavanagh DJ, Andrade J, May J. Imaginary relish and exquisite torture: The elaborated intrusion
871 theory of desire. *Psychological Review*. 2005;112(2):446-67.
- 872 19. Stults-Kolehmainen MA, Blacutt M, Bartholomew JB, Boullosa D, Janata P, Koo BB, et al. Urges to
873 Move and Other Motivation States for Physical Activity in Clinical and Healthy Populations: A Scoping
874 Review Protocol. *Frontiers in Psychology*. 2022;13.
- 875 20. Feige K. Wesen und Problematik der Sportmotivation. *Sportunterricht*. 1976;5:4-7.
- 876 21. Schiller D, Yu ANC, Alia-Klein N, Becker S, Cromwell HC, Dolcos F, et al. The Human Affectome.
877 *HAL*. 2022(hal-03728066).
- 878 22. Stults-Kolehmainen MA, Blacutt M, Fogelman N, Gilson TA, Stanforth PR, Divin AL, et al.
879 Measurement of Motivation States for Physical Activity and Sedentary Behavior: Development and
880 Validation of the CRAVE Scale. *Frontiers in Psychology*. 2021;12.
- 881 23. Stults-Kolehmainen MA. SciPod [Internet]. London: SciPod; 2022 July 6, 2022 [cited August 28,
882 2022]. Podcast. Available from: [https://www.scipod.global/dr-matthew-stults-kolehmainen-measuring-](https://www.scipod.global/dr-matthew-stults-kolehmainen-measuring-our-motivation-for-physical-activity-and-sedentary-behaviour/)
883 [our-motivation-for-physical-activity-and-sedentary-behaviour/](https://www.scipod.global/dr-matthew-stults-kolehmainen-measuring-our-motivation-for-physical-activity-and-sedentary-behaviour/)
- 884 24. Glaviano NR, Baellow A, Saliba S. Elevated Fear Avoidance Affects Lower Extremity Strength and
885 Squatting Kinematics in Women With Patellofemoral Pain. *Athletic Training & Sports Health Care*.
886 2019;11(4):192-200.
- 887 25. Brehm JW, Self EA. The Intensity of Motivation. *Annual Review of Psychology*. 1989;40(1):109-
888 31.
- 889 26. Frijda NH. Emotion, cognitive structure, and action tendency. *Cognition and Emotion*.
890 1987;1(2):115-43.
- 891 27. Frijda NH, Kuipers P, ter Schure E. Relations among emotion, appraisal, and emotional action
892 readiness. *Journal of Personality and Social Psychology*. 1989;57(2):212-28.
- 893 28. Frijda NH, Ridderinkhof KR, Rietveld E. Impulsive action: Emotional impulses and their control.
894 *Frontiers in Psychology*. 2014;5.

- 895 29. Inzlicht M, Schmeichel BJ, Macrae CN. Why self-control seems (but may not be) limited. *Trends*
896 *in Cognitive Sciences*. 2014;18(3):127-33.
- 897 30. Williams DM, Evans DR. Current Emotion Research in Health Behavior Science. *Emotion Review*.
898 2014;6(3):277-87.
- 899 31. Lieberman D. *Exercised: Why Something We Never Evolved to Do Is Healthy and Rewarding*.
900 New York: Knopf Doubleday Publishing Group; 2020.
- 901 32. Cheval B, Boisgontier M. The theory of effort minimization in physical activity (TEMPA). *Exercise*
902 *and Sport Sciences Reviews*. 2021.
- 903 33. Puhl R, Brownell KD. Bias, Discrimination, and Obesity. *Obesity Research*. 2001;9(12):788-805.
- 904 34. Braun V, Clarke V, Weate P. Using thematic analysis in sport and exercise research. In: Smith B,
905 Sparkes AC, editors. *Routledge handbook of qualitative research in sport and exercise*. London:
906 Routledge; 2016. p. 191-205.
- 907 35. Bonell C, Warren E, Melendez-Torres G. Methodological reflections on using qualitative research
908 to explore the causal mechanisms of complex health interventions. *Evaluation*. 2022;28(2):166-81.
- 909 36. R Core Team. R: A Language and environment for statistical computing. Version 4.0 ed2021. p.
910 Computer software.
- 911 37. Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qualitative health*
912 *research*. 2005;15(9):1277-88.
- 913 38. Gilson TA, Latimer M, Lochbaum M. Post-LDAC Reflections of ROTC Cadets: Relationship to
914 Leadership and Performance. *Journal of Applied Sport Psychology*. 2015;27(2):235-48.
- 915 39. Ryan RM, Deci EL. Active human nature: Self-determination theory and the promotion and
916 maintenance of sport, exercise and health. In: Hagger MS, Chatzisarantis NLD, editors. *Intrinsic*
917 *Motivation and Self-Determination in Exercise and Sport*. Champaign, IL: Human Kinetics; 2007. p. 1-20.
- 918 40. Robinson TE, Berridge KC. The neural basis of drug craving: An incentive-sensitization theory of
919 addiction. *Brain Research Reviews*. 1993;18(3):247-91.
- 920 41. Berridge KC, Robinson TE. What is the role of dopamine in reward: Hedonic impact, reward
921 learning, or incentive salience? *Brain Research Reviews*. 1998;28(3):309-69.
- 922 42. Koechlin E. Prefrontal executive function and adaptive behavior in complex environments.
923 *Current Opinion in Neurobiology*. 2016;37:1-6.
- 924 43. Antle MC, Silver R. Circadian insights into motivated behavior. *Behavioral neuroscience of*
925 *motivation*. 2015:137-69.
- 926 44. Hassandra M, Goudas M, Chroni S. Examining factors associated with intrinsic motivation in
927 physical education: a qualitative approach. *Psychology of Sport and Exercise*. 2003;4(3):211-23.
- 928 45. Deci EL, Ryan RM. The "what" and "why" of goal pursuits: Human needs and the self-
929 determination of behavior. *Psychological Inquiry*. 2000;11(4):227-68.
- 930 46. Maltagliati S, Sarrazin P, Isoard-Gautheur G, Pelletier L, Rocchi M, Cheval B. Action Planning
931 Makes Physical Activity More Automatic, Only If it Is Autonomously Regulated: A Moderated Mediation
932 Analysis. *SportRxiv*. 2022.
- 933 47. Stults-Kolehmainen MA, Sinha R. The effects of stress on physical activity and exercise. *Sports*
934 *Medicine*. 2014;44(1):81-121.
- 935 48. Stults-Kolehmainen MA, Lu T, Ciccolo JT, Bartholomew JB, Brotnow L, Sinha R. Higher chronic
936 psychological stress is associated with blunted affective responses to strenuous resistance exercise: RPE,
937 pleasure, pain. *Psychology of Sport and Exercise*. 2016;22:27-36.
- 938 49. Libet B, Gleason C, Wright E, Pearl D. Time of conscious intention to act in relation to onset of
939 cerebral activity (readiness-potential). *Brain*. 1983;106(3):623-42.
- 940 50. Scheer FAJL, Hu K, Evoniuk H, Kelly EE, Malhotra A, Hilton MF, et al. Impact of the human
941 circadian system, exercise, and their interaction on cardiovascular function. *Proceedings of the National*
942 *Academy of Sciences*. 2010;107(47):20541-6.

- 943 51. España RA, Plahn S, Berridge CW. Circadian-dependent and circadian-independent behavioral
944 actions of hypocretin/orexin. *Brain Research*. 2002;943(2):224-36.
- 945 52. Wen X, An Y, Li W, Du J, Xu W. How could physical activities and sleep influence affect inertia
946 and affect variability? Evidence based on ecological momentary assessment. *Current Psychology*.
947 2022;41(5):3055-61.
- 948 53. Koval P, Kuppens P, Allen NB, Sheeber L. Getting stuck in depression: The roles of rumination
949 and emotional inertia. *Cognition and Emotion*. 2012;26(8):1412-27.
- 950 54. Rhodes RE, Rebar AL. Physical Activity Habit: Complexities and Controversies. In: Verplanken B,
951 editor. *The Psychology of Habit: Theory, Mechanisms, Change, and Contexts*. Cham: Springer
952 International Publishing; 2018. p. 91-109.
- 953 55. Rebar AL, Gardner B, Rhodes RE, Verplanken B. The Measurement of Habit. In: Verplanken B,
954 editor. *The Psychology of Habit: Theory, Mechanisms, Change, and Contexts*. Cham: Springer
955 International Publishing; 2018. p. 31-49.
- 956 56. Resnicow K, Page SE. Embracing chaos and complexity: a quantum change for public health.
957 *American journal of public health*. 2008;98(8):1382-9.
- 958 57. Bargh JA, Chen M, Burrows L. Automaticity of social behavior: Direct effects of trait construct
959 and stereotype activation on action. *Journal of Personality and Social Psychology*. 1996;71(2):230-44.
- 960 58. Hofmann W, Kotabe, H.P, Vohs, K.D., Baumeister, R.F. Desire and Desire Regulation. In:
961 Hofmann W, Nordgren, L.F., editor. *The Psychology of Desire*. New York: Guilford Publications; 2015. p.
962 61-81.
- 963 59. deRidder DT, de Witt Huberts, J.C., Evers, C. License to Sin: Reasoning Processes in Desire. In:
964 Hofmann W, Nordgren, L.F., editor. *The Psychology of Desire*: Guilford Publications; 2015.
- 965 60. Bitterly TB, Mislavsky R, Dai H, Milkman KL. Want-should conflict: A synthesis of past research.
966 In: Hofmann W, Nordgren LF, editors. *The Psychology of Desire*. New York: Guilford; 2015. p. 244-64.
- 967 61. Saunders B, Milyavskaya M, Inzlicht M. Longitudinal evidence that Event Related Potential
968 measures of self-regulation do not predict everyday goal pursuit. *Nature Communications*. 2022;13(1):1-
969 14.
- 970 62. Hofmann W, Baumeister RF, Forster G, Vohs KD. Everyday Temptations: An Experience Sampling
971 Study of Desire, Conflict, and Self-Control. *Journal of Personality and Social Psychology*.
972 2012;102(6):1318-35.
- 973 63. Hofmann W, Van Dillen L. Desire: The New Hot Spot in Self-Control Research. *Current Directions*
974 *in Psychological Science*. 2012;21(5):317-22.
- 975 64. González-Cutre D, Sicilia Á, Moreno JA, Fernández-Balboa JM. Dispositional flow in physical
976 education: relationships with motivational climate, social goals, and perceived competence. *Journal of*
977 *Teaching in Physical Education*. 2009;28(4).
- 978 65. Baumeister RF, Heatherton T, Tice DM. Losing control: How and why people fail at self-
979 regulation1994.
- 980 66. Kwasnicka D, Dombrowski SU, White M, Sniehotta F. Theoretical explanations for maintenance
981 of behaviour change: a systematic review of behaviour theories. *Health Psychology Review*.
982 2016;10(3):277-96.
- 983 67. Ruissen GR, Beauchamp MR, Puterman E, Zumbo BD, Rhodes RE, Hives BA, et al. Continuous-
984 Time Modeling of the Bidirectional Relationship Between Incidental Affect and Physical Activity. *Annals*
985 *of Behavioral Medicine*. 2022.
- 986 68. Lutz RS, Lochbaum MR, Lanning B, Stinson LG, Brewer R. Cross-lagged relationships among
987 leisure-time exercise and perceived stress in blue-collar workers. *Journal of Sport & Exercise Psychology*.
988 2007;29(6):687-705.
- 989 69. Stults-Kolehmainen M, Filgueiras A, Blacutt M. Factors linked to changes in mental health
990 outcomes among Brazilians in quarantine due to COVID-19. *medRxiv*. 2021:2020.05.12.20099374.

- 991 70. Gilson TA, Heller EA, Stults-Kolehmainen MA. The relationship between an effort goal and self-
992 regulatory efficacy beliefs for Division I football players. *Journal of Strength and Conditioning Research*.
993 2013;27(10):2806-15.
- 994 71. Fredrickson BL. What Good Are Positive Emotions? *Rev Gen Psychol*. 1998;2(3):300-19.
- 995 72. Cheniaux E, Filgueiras A, Silva Rde A, Silveira LA, Nunes AL, Landeira-Fernandez J. Increased
996 energy/activity, not mood changes, is the core feature of mania. *J Affect Disord*. 2014;152-154:256-61.
- 997 73. Lu W, Bates FM, Waynor WR, Bazan C, Gao CE, Yanos PT. I feel frozen: Client perceptions of how
998 posttraumatic stress disorder impacts employment. *Psychiatr Rehabil J*. 2022;45(2):136-43.
- 999 74. Hamm AO, Richter J, Pané-Farré C, Westphal D, Wittchen H-U, Vossbeck-Elsebusch AN, et al.
1000 Panic disorder with agoraphobia from a behavioral neuroscience perspective: Applying the research
1001 principles formulated by the Research Domain Criteria (RDoC) initiative. *Psychophysiology*.
1002 2016;53(3):312-22.
- 1003 75. National Institute of Mental Health. Sensorimotor Dynamics (RDoc Constructs): National
1004 Institutes of Health,; 2022 [Available from: [https://www.nimh.nih.gov/research/research-funded-by-](https://www.nimh.nih.gov/research/research-funded-by-nimh/rdoc/constructs/sensorimotor-dynamics)
1005 [nimh/rdoc/constructs/sensorimotor-dynamics](https://www.nimh.nih.gov/research/research-funded-by-nimh/rdoc/constructs/sensorimotor-dynamics)].
- 1006 76. Booth FW, Laye MJ, Roberts MD. Lifetime sedentary living accelerates some aspects of
1007 secondary aging. *Journal of Applied Physiology*. 2011;111(5):1497-504.
- 1008 77. Kilpatrick M, Hebert E, Bartholomew J. College Students' Motivation for Physical Activity:
1009 Differentiating Men's and Women's Motives for Sport Participation and Exercise. *Journal of American*
1010 *College Health*. 2005;54:87-94.
- 1011 78. Peterson L, Renstrom PAFH. *Sports Injuries: Prevention, Treatment and Rehabilitation*. Fourth
1012 ed. London: Routledge; 2016.
- 1013 79. Chakravarthy MV, Booth FW. Eating, exercise, and "thrifty" genotypes: connecting the dots
1014 toward an evolutionary understanding of modern chronic diseases. *J Appl Physiol* (1985). 2004;96(1):3-
1015 10.
- 1016 80. Naves-Bittencourt W, Mendonça-de-Sousa A, Stults-Kolehmainen M, Fontes E, Córdova C,
1017 Demarzo M, et al. Martial Arts: Mindful exercise to combat stress. *European Journal of Human*
1018 *Movement*. 2015;34:34-51.
- 1019 81. Stults-Kolehmainen M, Malcolm LR, DiLoreto J, Gunnet-Shoval K, Rathbun EI. Psychological
1020 Interventions for weight management: A Primer for the Allied Health Professional. *ACSM's Health Fit J*.
1021 2015;19(5):16-22.
- 1022 82. Hardeman W, Houghton J, Lane K, Jones A, Naughton F. A systematic review of just-in-time
1023 adaptive interventions (JITIs) to promote physical activity. *International Journal of Behavioral Nutrition*
1024 *and Physical Activity*. 2019;16(1):31.
- 1025 83. King AC, Hekler EB, Grieco LA, Winter SJ, Sheats JL, Buman MP, et al. Effects of Three
1026 Motivationally Targeted Mobile Device Applications on Initial Physical Activity and Sedentary Behavior
1027 Change in Midlife and Older Adults: A Randomized Trial. *PLoS One*. 2016;11(6):e0156370.
- 1028 84. Evans AH, Katzenschlager R, Paviour D, O'Sullivan JD, Appel S, Lawrence AD, et al. Punding in
1029 Parkinson's disease: Its relation to the dopamine dysregulation syndrome. *Movement Disorders*.
1030 2004;19(4):397-405.
- 1031 85. Marcora SM, Staiano W. The limit to exercise tolerance in humans: mind over muscle? *European*
1032 *Journal of Applied Physiology*. 2010;109(4):763-70.
- 1033 86. Boullousa DA, Nakamura FY. The evolutionary significance of fatigue. *Frontiers in Physiology*.
1034 2013;4(309).
- 1035 87. Barker JL, Kolar D, Lazzer AS-D, Keel PK. Exercise Satiation: A novel theoretical conceptualization
1036 for problematic exercise observed in eating disorders. *International Journal of Eating Disorders*.
1037 2022;55(2):176-9.

Table 1. Correlation Matrix (Pearson’s *r*) and descriptive statistics for “Past week” (PW) and “Right now” (RN) versions of the CRAVE Scale, measuring desires and wants to move and rest

	RN MOVE PRE	RN REST PRE	RN MOVE POST	RN REST POST	PW MOVE PRE	PW REST PRE
RN MOVE PRE	—					
RN REST PRE	-.66**	—				
RN MOVE POST	.59*	-.08	—			
RN REST POST	-.45	.39	-.71**	—		
PW MOVE PRE	.51*	-.53*	.42	-.58*	—	
PW REST PRE	-.35	.49*	-.42	.67**	-.74***	—
Mean	28.9	17.3	35.3	11.9	33.7	16.5
SD	9.8	10.9	8.9	8.3	8.0	7.6

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

Table 2. Paired Samples T-Tests comparing pre- versus post-interview time points for both “right now” (RN) and “past week” (PW) versions of the CRAVE scale

								95% Confidence Interval	
		t	df	p-value	Mean difference	SE difference	Effect Size (Cohen's d)	Lower	Upper
RN MOVE PRE	RN MOVE POST	-3.129	16	.0065	-6.412	2.049	-0.759	-1.292	-0.208
RN REST PRE	RN REST POST	2.054	16	.0567	5.412	2.635	0.498	-0.014	0.997
RN MOVE PRE	RN REST PRE	2.533	16	.0221	11.588	4.575	0.614	0.086	1.127
RN MOVE POST	RN REST POST	6.091	16	< .0001	23.412	3.843	1.477	0.771	2.162
PW MOVE PRE	RN MOVE PRE	2.234	16	.0401	4.824	2.160	0.542	0.024	1.045
PW REST PRE	RN REST PRE	-0.322	16	.7517	-0.765	2.376	-0.078	-0.553	0.399
PW MOVE PRE	PW REST PRE	4.874	16	.0002	17.176	3.524	1.182	0.546	1.797

1041

1042

1043

Table 3. Qualitative evidence for ACMS for movement / physical activity / exercise and rest / sedentary behaviors *

		MOVE	REST
WANT	Recently	<u>RECENTLY</u> "My desire has been pretty high to move and be active." (9/17, A) "I have been wanting to move around a lot." (9/17, B) "I am trying to get [my desire] back up so I can actually work out." (9/21, A) "Over the past week I wanted to move a little bit more." (9/21, A) "In the past few days I've wanted to move around a little bit more." (9/21, A) "I think I am still on a 'move thing' right now. I went hiking on Saturday and afterwards I went out [to socialize]. Even though I am tired I don't really want to stop." (9/21, C) "I really wanted to move over the past week more than I have consistently over the first few weeks of the semester." (9/10, B) "I get like random bursts of energy, and it makes me really motivated, and it like makes me want to get more done, and it makes me wanna go on runs, go on walks, get more homework done, or get the next week's homework done." (9/13, A) "...Over spring break our coach tells us... 'You shouldn't be training ... You shouldn't be pushing yourself to any degree that's beyond something casual' ... By the time you get back from spring break you're dying to get a hard workout in [and] get that sweat going ... You miss it, and ... you're reinvigorated [and] wanting to train and push yourself. It's a craving." (9/17, A) "The workload is not too heavy - so I am feeling like I wish we were doing a bit more [exercise]." (9/17, A)	"Over the past week, I have wanted to rest a lot." (9/10, A) "I just wanted to sit down." (8/31, A) "I just wanted to go to sleep." (9/17, A)
		Now <u>NOW</u> "I have had a jam-packed day full of stuff, and I am going to be going until 11pm - so it's a bit more like jolty, anxiety movement. I want to kick my foot around a little, or shake a bit, just to get rid of that nervous energy, in terms of moving, in terms of exercise or working out" (9/27, A) "... I want to work out." (8/31, C) "I wanna get out and train" (9/17, A) "I'd say yeah, I wanna move right now but, not like I'm itching to get out of my seat and go run." (9/17, A) "... I feel urged to move and get stuff done ..." (9/27, A) "I want to [move] but I guess I don't really want to heavily exert myself..." (8/31, D)	"I definitely crave rest a lot. I crave just sitting! Sitting is nice. It is very good. Sitting here during the interview is very good. It's nice." (9/27, A) "I would really love to be laying down right now in a fetal position with my teddy bear. That would be ideal because I don't get enough sleep, and it would be nice to just take a nap right now." (9/27, A)
		"I have NOT wanted to move more than the necessary amount" (9/21, A) Recently "A time where I really wanted to just slow down and do nothing or just rest... was, not really rest, in itself, but just not move." (9/10, B)	"Last night I felt like I couldn't fall asleep. I was just awake and had this jitteriness - almost where it was hard for me to fall asleep. I didn't want to rest" (9/17, A)
DON'T WANT	Recently	"... We'll finish a game, [maybe] the next day we have off, I'm like, "oh, I wanna go to the gym". He's like, "I'm wiped out from yesterday, I don't wanna go to the gym". (9/17, A)	"I have not been willing to get any rest [and] because of that it has been impacting my over sleep." (9/21, B)
		Now "I don't want to move at all" (9/10, B)	"I just do NOT want to get any rest." (9/21, B)

* Note that some participants made slightly conflicting statements from one part of the interview to another, or more simply, their motivation state changed over time.

Table 4. Qualitative evidence for the WANT model

#	Tenet of the WANT model	Qualitative evidence (for)	Qualitative evidence (against)
1	Humans have desires to move and rest.	See Table 3 above.	
2	Desires for movement and rest are two separate systems	"If I just don't want to go to practice [for sports] - I want to rest that day. That's completely different from craving and needing to rest." (8/31, A)	
3	These desires have both approach and avoidance motivation	See Table 3 above.	
4	Desires vary in strength from very weak to nearly unavoidable/maximal, where they might be felt as an urge or craving.	"... want/desire are a little lower compared to urge and crave. Those are more towards the need to do something. When you want to do it, you don't necessarily do it, but if you have the urge or if you really crave to do it, then you are going to do it ..." (8/31, A) "In terms of wanting to move...desires are where it would be nice if I moved - it would be nice if I worked out, but it's never going to happen." (9/27, A) "I think that craving or urges to rest are BOTH physical [sensations] and mental [thoughts]. However, when I want to rest - I feel that want is usually either physical or mental, but not both. For want, its like "oh, I'm kinda tired- I want to rest", but I still have the [physical] energy in me to keep doing something. I feel that crave [to rest] is when everything in me is just like, "I can't do this anymore; I just need to stop." (8/31, D)	"I would say that the want, desire and urge - the whole set - feels the same to me." "They are not super different. I don't think." (8/31, B)
5	Wants/desires are highly transitory – representing a state.	"I'd say a 'want' to rest is maybe more of a short-term feeling for me. I just finished a game, you know, my body's tired. I just want to, I just want to chill out for a second, rehydrate, eat something. Whereas desire or urge to rest, I feel is more created by longer-term circumstance, whether it's that we've been in preseason now, and you're training twice a day, every day, and you're just thinking, "All I want is to just relax and rest and catch up on sleep" or whatever it may be." (9/17, A) "I think that want and desire as more like a superficial thing. It's not going to last. It's short term, but then urge or crave is almost like you physically need to." (9/17, C) "I only crave rest right after I wake up, because I feel that as soon as I get going in the day its fine. If I actually get myself up, the craving for rest goes away. So, I will wake up and its, "Oh my god - it's 7am. All I want is to go back to the bed. And then as soon as I go brush my teeth or something, I'm thinking, "What was I tired for?" and it's fine. I woke up that way essentially, and the craving goes away, and I am fine for the rest of the day." (9/21, C)	
6	ACMS change based on previous behaviors (i.e., the provision or avoidance or certain physical stimuli, such as exercise).	"Craving is more when I am doing something [highly] repetitive because I am bored of the same activity, so I want to do something else, if that's resting, being on my phone, or just laying down or watching TV. While want and desire is when I am doing something in the moment - let's say I am working out, and I think 'Oh, I want to stop'". (8/31, B) "...over spring break our coach tells us... you shouldn't be training ... you shouldn't be pushing yourself to any degree that's beyond something casual ... by the time you get back from spring break you're dying to get a hard	

		workout in that get that sweat going ... you miss it, and ... you're reinvigorated [and] wanting to train and push yourself. It's a craving." (9/17, A)
		"I think I have the urge when something is going on in my life where I just need to get out, and I need to run if I have been sitting for a long time. I need to just run on vacations. We would always stop at a rest area for a road trip, and I would literally just get out because when I was little I'd just run to the playground. I needed to run because I craved moving because I was in the car for about 10 hours." (8/31, D)
		"... after a long time of movement you want to rest, but [after] a long time of resting, you <u>don't</u> want to get up and you know, run two miles." (9/8, A)
7	Desires to move and rest interact asynchronously	"I was a bit hungover, and I was stuck to my bed because I was a bit nauseous but, I [couldn't] fall asleep. [I thought] "If you can't rest, you should be doing something", and, it was very, annoying because I wanted to begin, cleaning my room, "I'm awake, I should be moving", but I needed my eyes to be closed and a pillow over my head, I couldn't satisfy the urge to move and get stuff done, and that was very stressful." (9/27, A)
8	A total lack of desire is possible	"I don't want to do anything right now." (9/21, D)
9	ACMS differ from psychosomatic sensations, such as energy and fatigue	"I get like random bursts of like energy, and it makes me really motivated, and it like makes me want to get more done, and it makes me wanna go on runs, go on walks, get more homework done, or get the next week's homework done." (9/13, A)
		"The desire to rest is more motivated by my body and how my body is feeling and the desire to move is more like a mental thing." (9/17, A)
		"I am just too tired. I have wanted to be active, but I just don't always have that energy." (9/10, A)
10	They differ from emotions but might vary systematically with certain emotions and situations	"What makes me want to move is just the joy I get from playing sports. I enjoy exercising [and] definitely feel motivated..." (9/17, A)
		"When I get overwhelmed, I prefer to rest and just being alone resting." (9/10, C)

Table 5 - Qualitative evidence that affectively-charged motivation states (ACMS) have influence on movement and sedentary behaviors.

	Qualitative evidence for	Qualitative evidence against
Movement / physical activity / exercise	"If I really want to exercise I will make time for it." (9/10, B)	"‘Want’ is more knowing I should, but it doesn't incite me to actually do it. Want is just, 'I should probably do this, because I know it's good for me', but I don't actually do it." (8/31, D)
	"The want and desire are feeling motivated but not really motivated, and then [urges and cravings] are, "Oh, I'm going to do this. I'm going to get up. I'm going to do move. You want to get out, you want to do the exercise or whatever the movement is." (8/31, C)	"I sometimes actually move when I have a 'want' to move, but it takes a lot more will power to do it." (8/31, D)
	"I remember all of last summer, every morning, I craved to work out, and I craved to practice even though I couldn't go. In my own time in my backyard I would work out and mimic a practice by myself because I craved it." (8/31, B)	"I have a lot of friends on social media who will post gym selfies, and when I see those I'm feeling like, "Ah, look at them. I should probably do that!" That's an outside factor that potentially pushes me to want to move or do what they are doing. It never really happens, but definitely I mentally get that, but not physically." (9/27, A)
Rest / sedentary behaviors	"... when I desire rest, it's much more appealing [than movement]. And I very much try my very best to make it happen. And if I desire to take a nap, I feel you will be able to tell it more. I'll be kinda drooping a bit. I'll be a bit more tired. Not as talkative, versus if I want to move, I don't know if you'd necessarily see that in a physical appearance." (9/27, A)	None observed
	"I feel that crave [to rest] is when everything in me is just like, "I can't do this anymore; I just need to stop." (8/31, D)	
	"... it's a natural thing [where] you crave sleep because you can't really just stay up all the time because you need to sleep. It's more primal, I guess. Because everyone has to sleep." (9/15, A)	

1046

1047

FIGURE CAPTIONS

Figure 1. Motivation states to move and rest rated “over the past week” (PW, pre only) and “right now” (RN, pre and post)

Figure 2. Final model of the 43 higher order themes (HOTs) categorized into six super higher order themes (SHOTs)

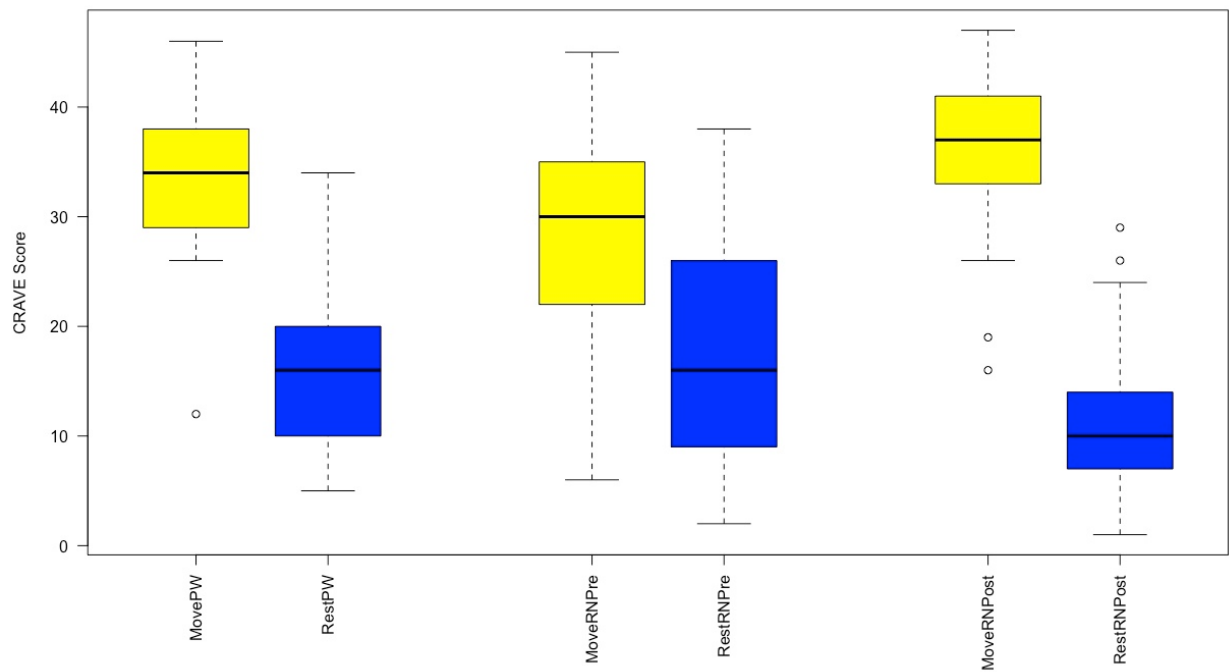
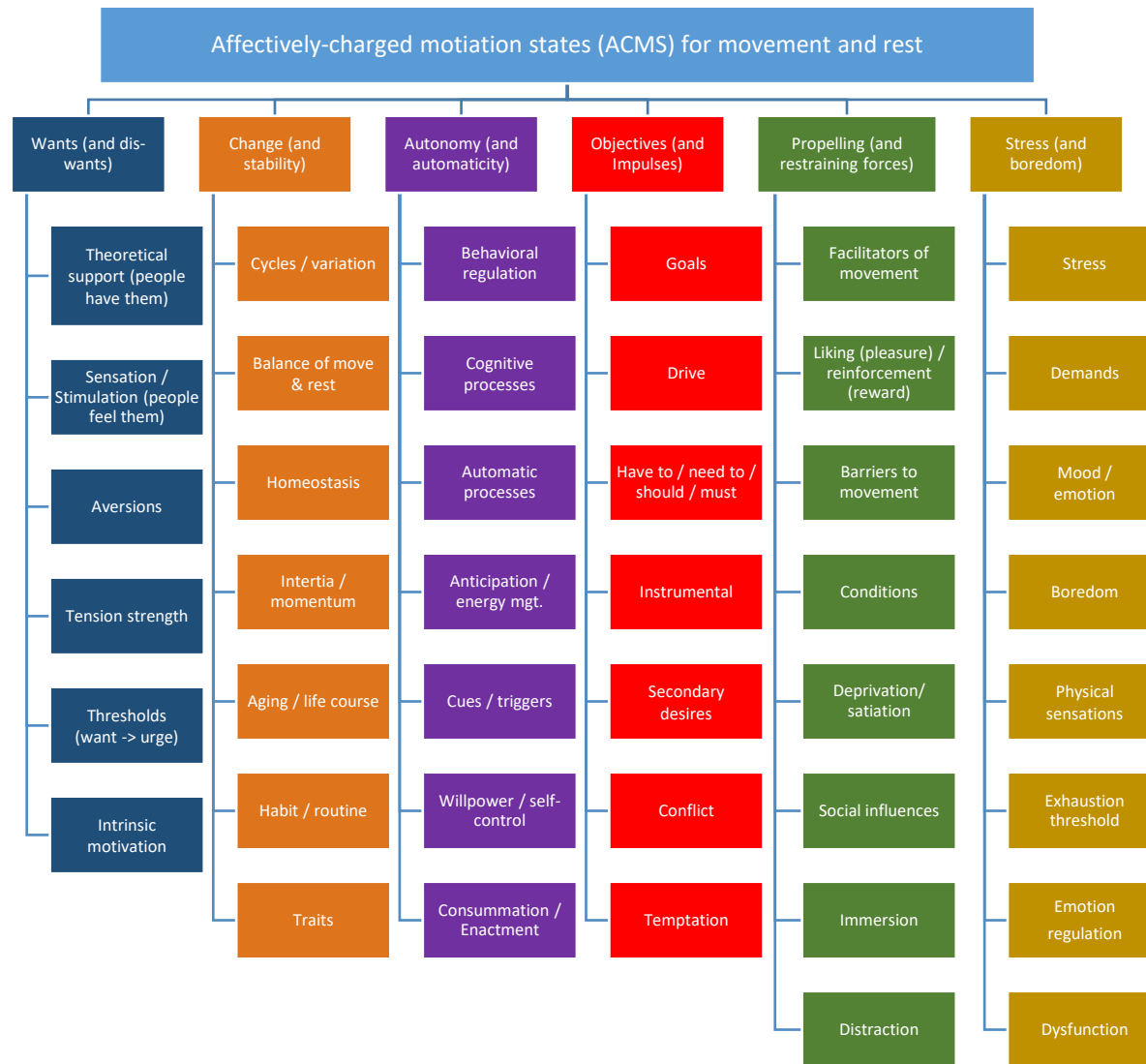


Figure 1

1076



1077

1078

1079 Figure 2

1080 **Supplement 1. Focus group interview questions**

1081

1082 Q1 - How much have you wanted to *move* over the past week?

1083 Q2 - How much have you wanted to *rest* over the past week?

1084 Q3 - Do you want to *move* right now?

1085 Q4 - Do you want to *rest* right now?

1086 Q5 - What makes you want to *move*?

1087 Q6 - What makes you want to *rest*?

1088 Q7 - How do you experience motivational states related to *movement*?

1089 Q8 - How do you experience motivational states related to *rest*?

1090 Q9 - Describe a recent time you had a desire, want, urge to *move or rest*.

1091 Q10 - How do external factors impact urges to *move or rest*?

1092 Q11 - Describe a time when you had a strong urge to *move or rest*, but were unable to satisfy that
1093 urge.

1094 Q12 - Do you feel an enhanced urge to *move or rest*, compared to the start of this interview?

1095

1096

Supplement 2. Super Higher Order Theme 1: Want – and do not want

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Sensations / stimulation	People subjectively feel wants to move and rest	62	Feeling restless; Feeling jittery; Feeling antsy; “cooped up” Feeling stiff from sitting a long time; Nervous tension	"I've been pretty restless lately, so I've been running around in my dorm, organizing things." (9/8, A) "Last night ... I was just awake and had this jittery-ness - almost where it was hard for me to fall asleep. I didn't want to rest." (9/17, A) "...after not doing anything all morning, and now I'm actually feeling a little bit antsy..." (9/17, A) "When we are sitting doing homework for a really long time, I wanna be more physically active or just move around so that my legs or [all of my body] isn't stiffened up." (8/32, D)
2	Theoretical support	Support for the concept of ACMS and the WANT model	37	Theory (for WANT model); People actually have desires to move; Cravings for rest exist; Wants to take a nap; Rest more than move; People have aversions for movement; Don't want to rest; Wants to move vary in intensity; Don't want to do anything at all, including move or rest; Wants to move influence behavior; Lack of desire to rest --> affects sleep; Feel an enhanced urge to move or rest	See Tables 3 and 4 above.
3	Tension strength	ACMS range from very weak to very strong in magnitude	17	Weak vs strong tension; Desire- not strong enough to make movement happen	See Table 4 above.
4	Aversions / dread	People have active motivation to avoid movement and rest	11	Aversion to move; Wanted to not move; Can't rest	See Table 3 above.
5	Intrinsic motivation	Similar to concept of intrinsic motivation in Self-	7	Wants/desires to move associated with anticipations of pleasure, fun and enjoyment;	"Sometimes, running in the rain is fun." (9/15, A)

		Determination Theory.		Desire to scavenge, be curious, explore, move about; want - movement for its own sake, not to accomplish something else	"What makes me want to move is just the joy I get from playing sports. I enjoy exercising, weight training, conditioning, running, stuff like that. I would definitely feel more motivated by playing sports." (9/17, A) "Soccer playing and training is the most enjoyable part of my day." (9/17, A) "I urge myself to move because I know that I need to ... get myself to walk around and get some fresh air or just experience all of the things around me." (9/13, A)
6	Thresholds differentiating ACMS	Desires and wants are weaker than urges and cravings	5	Urge - have to cross a threshold of exhaustion; Urge / crave has greater intensity and similar to a "need to"; Very similar constructs	See Table 4 above.

TOTAL = 139

* These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTs, but efforts were made to place unique quotes only into 1 (or two) HOTs.

1097

1098

Supplement 3. Super Higher Order Theme 2: Change and stability

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Cycles / variation	Psychological and biological rhythms and regulated change	35	Seasonal variation / holidays / transition to college; Weekly variation (e.g., it's a Monday); Work schedule; Stability or consistency of schedules (e.g., sleep); Just woke up; Time of day (e.g., AM / PM, sunrise / sunset)	"Later in the day is just when I really want to rest." (9/17, B) " ... I had this really big burst of energy over the weekend, and now I am falling back down again - so I am trying to get back up so I can be healthy and work out." (9/21, A) "I remember all of last summer, every morning, I craved to workout, and I craved to practice even though I couldn't go. In my own time in my backyard I would work out and mimic a practice by myself because I craved it." (8/31, B) "In the mornings I really wannabe active" (8/31, D).
2	Homeostasis	Processes of returning to a set point	25	Can sleep better if has moved; Got a sufficient (or an excess) of sleep last night; Need to recover (so can be more active); Overexertion -> need rest; Under exertion -> need to move more; Crave - return to homeostasis; Desire - move to return to homeostasis	"If I worked out previously, I probably just want to rest, and if I have a big exam, I want to do that and later devote my energy to working out." (9/10, B) "The workload is not too heavy -- so I am feeling like I wish we were doing a bit more." (9/17, A)
3	Inertia / momentum	Movement begets more movement and sedentarism begets more sedentarism	15	Have just been moving; Resting and being lazy; Wanting to move, but lacking energy Feeling "Stuck"; stuck in a rut, trapped, frozen; Inertia and momentum; Sometimes can't move; Inertia; Wanted to keep moving after school activity; Want to move on a busy day; Momentum; Move - brain won't "shut-off"; Want to continue moving; Want to continue moving	"I would say yes [I want to move right now] and that is partially because I walked here, and I have already started to move." (9/10, A) "I have ADHD ... I will find myself stuck in a rut, and I'm just, watching TV, reading a book, something like that, which is fine and all, but I'll be doing it for hours...[but] I want to work out, or I want to take my dog on a walk. There's nothing in the world that is making me not move, it's just my brain just gets like stuck - almost frozen. Usually, it's not something like outside that's, stopping me from doing it. It's myself. Like when an object, in motion...tends to stay in motion. If I stop, I just know I'm not gonna be doing anything for the rest of the day, unfortunately. It kinda feels like sleep paralysis sometimes where you know it's happening, you want to make it stop, or you want to move, but you just cannot. It's a little depressing [laughs], you know? [I'm thinking], "I wish I could". (9/10, A)

					"Getting up and moving is harder [when not already moving], but when I have a busy day, I want AND desire to move." (9/10, A)
4	Balance of movement and rest	Periods of rest are necessarily followed by periods of movement and vice versa.	11	Desire to move - when not moving; Laziness; Being sedentary; Crave movement with absence of movement; Want rest after movement; Mental break needed; Move/rest balance; Movement can be a source of rest	"There are days when I wanna move more, because I've been resting, and there are other days when I wanna rest more because I've been moving." (8/31, A) "When you've been sitting in class for a while, you just wanna move around." (8/31, A) "For me, resting is sometimes going out on a walk and just enjoying the outside. I don't need to rest by sitting down because for me being active also gives me some rest because it lets my mind go free." (8/31, B) "I feel sometimes for me mental rest comes with physically being active. I can just exert myself without having to think about school." (8/31, D) "Craving is more when I am doing something [highly] repetitive because I am bored of the same activity, so I want to do something else, if that's resting, being on my phone, or just laying down or watching TV. While want and desire is when I am doing something in the moment - let's say I am working out, and I think 'Oh, I want to stop'". (8/31, B) "I need the rest to be able to be more active." (8/31, B)
5	Habit / routine	Regularity of health behaviors	11	Habit / routine Sleep schedule / routine / consistently of schedule Weekly schedule Self-care	"I usually like to go to the gym and run a lot." (9/15, A) "I have wanted to rest a lot, and that is because I just don't have a good sleep schedule." (9/10, A)
6	Traits	Enduring characteristics of a person	2	Desire to rest as a trait, not a state Desire to move as a trait, not a state	"I'm also a morning person so I wake up at 6am." (9/21, A) "I [wanna] be that person who enjoys running in negative-ten-degree weather" you know?" (8/31, D) "I'm the kind of person who likes to sleep." (9/13, A)
7	Aging / life course	Effects of aging on motivation states	1	Age / being a teenager or young adult	Interviewer: "... what made you want to rest [last week]?" Participant A: "... just [being] like a normal... person... not person but [a] normal teenager." (9/13, A)

TOTAL = 100

* These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTs, but efforts were made to place unique quotes only into 1 (or two) HOTs.

1099
1100

Supplement 4. Super Higher Order Theme 3: Autonomy and automaticity

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Automatic processes	Effects of automaticity, randomness and spontaneity	15	Random bursts of energy; Randomness depends on the day; Spontaneity; Randomness: Some days need to move, some need to rest; Start taking action when feel an urge; Urge & crave: These are when there is a certain course of action determined; Want happen automatically at certain times	"I get like random bursts of like energy, and it makes me really motivated, and it like makes me want to get more done, and it makes me wanna go on runs, go on walks, get more homework done, or get the next week's homework done." (9/13, A) "... You've been doing something, like studying, for a while, and you just get a random burst of energy, and then you run around your dorm." (9/8, A) "... Sometimes I get the urge to [move]. It just depends on the day." (9/17, C) "We all have instances when we want to get up and do things, but we all have instances where we just want to sit around and watch TV for a day or something." (9/8, A)
2	Cognitive processes	Thoughts and higher order thinking.	14	Highly focused on desire / cognitive hijacking; Cognition - think about it more when you can't do it; Desire - triggered by memories of former athletic self; Urge - thinking about it more and obsessive thoughts; Want / desire - have less priority; Urge/craving - have higher priority; Lacking confidence; Awareness; Choices	"When I have an urge to move, in my head I start hyper-focusing on it. I'm thinking, "Okay, what can I do after this moment". If I am stuck in class I'm thinking, "Okay, could I go work out? Could I go walk? Could I do this?" I'm thinking, "Okay, I am ready to go - now!" (9/21, A) "A want for rest would be similar to you're in class and you want to sleep, but you have other things [to do]. It's the same thing. You just put it at the bottom of your priority list." (9/15, A) Related quotes found above and below.
3	Behavioral regulation	Processes of managing behavior to achieve certain outcomes	11	Can't rest - need to be productive / do work / play sport; Conscious decision making to weigh the motivation states; Should / Need to recover and prioritize rest; Change behavior patterns;	"If I meet everything, and I'm gonna do this, things will be fine, but then also because I am literally exhausted." (8/31, D) "After making that decision of wanting to rest, [I thought], "Oh, if you rest, or if you move, nothing really stops", and so, those conscious, decisions of, "How am I feeling now? And what will come in the future? And what should I do? What would be more beneficial for me, to prepare myself for the future?" (9/10, B) "Right now I am thinking about what homework I am doing when I am done with this interview - instead of thinking about getting ready for or going to bed tonight." (9/21, C) "I just got into running, and I was thinking, "okay, tomorrow morning, two-mile run okay?" [And then] I didn't do it. I stayed in bed, I was thinking, "oh, I think I'm gonna sleep an extra hour". So that was my failed attempt to move. But yeah - I had

					a plan. I was thinking, "okay, 7am, wak[ing] up" [laughs], and "no I, I'll sleep until 8:00, I have time" [laughs]... and, I don't know, I think I was just really, tired and overwhelmed." (9/21, B)
4	Anticipation/ energy mgt.	Looking into the future for upcoming energetic demands and recovery	10	"Psyching" the self up / "pumping up"; Anticipating the next thing to do; Reserving energy for the next task; Knowing that planned physical activity is getting closer; Knowing you have a full day ahead; Looking forward to exercise; Managing energy / rationing or conserving	"I definitely don't feel as much of an urge to rest, definitely more energized now that we're talking. I enjoy this [laughs], so, [it] makes me feel good and also it's 2:16pm. I have another tour to give so subconsciously I'm pumping myself up...just to get ready for the next thing that I have to do." (9/27, A) "I will tell myself, 'You know you have this long until this assignment or whatever is due, and <u>you need to get up</u> and get that done or you know you'll get a percentage taken off, or the points taken off, and you don't want that' so it's kind of like, trying to give myself a pep talk to get myself up to move. And sometimes it works, but if it doesn't, I will rest just a little bit longer, and then I'm like "ok, <u>you gotta get up</u> and go." (9/13, A) "I try to save my moving for that period where I have to be really active and engaged." (9/21, A) "I've been anticipating practice [for sports]." (9/10, A) "I think what makes me want to rest if what's next to come, just in preparation - anticipation. Mentally preparing or mentally resting for whatever's next to come in my schedule." (9/10, B)
5	Cues / triggers / feedback	Effect of stimuli on motivation states	8	Fitness tracker feedback; Desires / wants - triggered by a cue or event; Negative emotions -> want to move more (to get rid of stress); Positive emotions -> want to move more (on a win streak); Music (lyrics)	"[I will read] 'here are the top 10 exercises you should be doing to work on getting rid of your stomach fat' or 'trimming down your thighs', and I will read those articles and [will think] 'oh, you know, what are those exercises?' and then I will instantly [think] 'Oh, I should try these, I should be doing this'. (9/27, A) "When things are going well you want to keep playing and keep on the field" (9/17, A) "When I'm getting ready to go out [to socialize], and I finish, [I see myself in the mirror, and] I think, "Oh yeah, I look, I look okay!", and then it makes me wanna go out and do stuff." (9/8, A)
6	Willpower / self-control	Resistance provided by the self in the face of desire	4	Depending on willpower / forcing self to do something; Getting psyched up; Wandering / unfocused mind	"I think when I have wants for rest, I usually, even if I have other priorities like homework, I'll give in to it, almost too easily. I will find myself scrolling on my phone when I'm supposed to be doing homework. It's kinda hard not to give in." (9/21, D) "I am trying to get [my desire] back up so I can actually work out" (9/21, A) "Sometimes I desire to rest because I don't let myself get enough sleep." (9/13, A)
7	Consummation / Behavioral enactment	Actual engagement in the focus	2	Took a nap; Worked out this morning	See Table 5 above.

on one's desire
TOTAL = 64

* * These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTs, but efforts were made to place unique quotes only into 1 (or two) HOTs.

1101
1102

Supplement 5. Super Higher Order Theme 4: Objectives and impulses

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Goals	Desired endpoint, condition or achievement	29	"Have to" or "should" - based on a goal; Goals - more like "force myself"; Move to achieve a goal; Goal to be healthy results in motivation for exercise; Goals to develop confidence, energy, get into a routine, be healthy, be productive, lose weight, improve appearance, etc.; Movement goal; Achieved goal; Was productive; Inspired to move; Aspirations to move; Had bad experience and wanted to improve; Start planning about possibility for the future; Self-improvement	"I see the exercise[s] as something I can achieve - and my goal at some point down the line. That is usually the main moment where I think, "I very much want to move." (9/27, A) "[What makes me want to move is] more like step count, you know? It's like, 'I haven't reached my goal yet'... because you can't see it go down the next day, you know?" (8/31, D) "I don't want to heavily exert myself because I have already done that today, and I have checked that off my list." (8/31, D) "For me it would definitely also be, about, keeping, myself healthy..." (9/17, B) "... I would say that that moment, yeah, that moment I just felt inspired to, to move, all aspects and change my, life around." (9/10, B)
2	Drive	Internal force to move or sleep, similar to hunger, thirst, etc.	18	Activity quota: Must get some activity in every day (internal need for it); Drive to sleep; Drive to recharge and recover; Having hyperactivity / having a burst of energy; Understimulation; Need to move; Urgent movement into action	"Each day I need to be active, but then I rest because of the activity." (8/31, D) "I need to sleep - now." (8/31, D) "... it's a natural thing [where] you crave sleep because you can't really just stay up all the time because you need to sleep. It's more primal, I guess. Because everyone has to sleep. You don't have to move. Well, I guess it depends. There are people who don't really move. But there are some people that do. But everyone sleeps, no matter how active you are." (9/15, A) "I feel like I'm not doing anything - so I wanna get up and move." (8/31, B) "I think that want and desire as more like a superficial thing. It's not going to last. It's short term, but then urge or crave is almost like you physically need to." (9/17, C)
3	Have to/ need to/ should / must	Extrinsic forms of motivation, such as external and introjected regulation	12	Commitments - have to run Shoulds; Shoulds / "have to's" can undermine wants / desires; Motivation states similar to a "need to"; Motivation states similar to a "should"; Motivation states feeling like guilt for not moving;	"I feel like I shouldn't move because it would distract me from my emotions, basically. If I am really sad I use running as an excuse to continue to be in that sadness, instead of facing what's actually making me sad." (8/31, D) "... [I am thinking], "okay, I've earned, the right to go to sleep, I've earned the right to rest", and now my body will actually let myself rest without me [thinking] "I still have stuff to do, <u>I can't</u> relax" [laughs] "<u>I can't</u> rest". (9/27, A)

					"I guess a want to move is when you know you haven't exercised in a while and you know you probably should and you really want to, but it's not enough to actually do it. You put it on your priority list, but it's at the bottom." (9/15, A) "I urge myself to move because I know that I <u>need to</u> - because I am either sitting down all day in classes, and I know <u>I need to</u> get myself to walk around and get some fresh air or just experience all of the things around me." (9/13, A) "If I want to move, that is usually me laying on the couch feeling bad about myself [for not moving], but I also don't really have any desire to move. The want is 'eh, I should probably do this, because I know its good for me', but I don't actually do it" (8/31, D)
4	Instrumental demands	Movement and rest as having utility and something you must do in life, mostly mindlessly	12	Movement as instrumental - have to move to get to places; Movement as instrumental only; Can't move: Have to be sedentary due to task at hand; Have to move: build environment forces you to move; Have to move: athlete Have to move: Performances/ rehearsals / work activity Movement you are paid to do / Labor - not internally motivated to do; Utility of movement	"You walk in order to get someplace. You don't walk to enjoy it, unless you're doing it to enjoy it." (9/27, A) "There's movement I do out of utility." (9/17, A) "I am taking notes so I can't move during that." (9/21, C) "I'm not motivated to do [the walking], but I still do it because you have to do it for the [job]." (9/27, A) "I'm on cross country, so I have practice every morning, so I absolutely like have to [move and be active]." (8/31, D)
5	Conflict	Desires impinging on each other	10	Want to move but will rest when tired; Conflict / competition of different desires occurring at the same time; Conflicts between desires to rest and move; Torn between two decisions; Want to move and urge to rest at the same time - busy day; Motivation states strong enough to override other desires; Considering future commitments;	"Some days, coming home from work <u>I want to rest</u>. There are some days <u>I want to move as well</u> because I work mornings sometimes on Sundays, and I come back and I'm like, "Oh, well I have stuff to do. I <u>need to move</u> and get that done", but I can't because I'm tired in some ways, but I <u>know I need to get them done</u>, so I can't. It's a constant battle between the two of them, and I don't know how to combat either one of them. I will do a little bit of both move and rest. I will sit and give myself a time limit to rest, and then <u>I will force myself to get up</u>. I will tell myself, "You know you have this long until this assignment or whatever is due, and <u>you need to get up</u> and get that done or you know you'll get a percentage taken off, or the points taken off, and you don't want that" so it's kind of like, trying to give myself a pep talk to get myself up to move. And sometimes it works, but if it doesn't, I will rest just a little bit longer, and then I'm like "ok, <u>you gotta get up</u> and go." (9/13, A)

6	Secondary desires	Desire to move or rest only as secondary to some other desire that is important.	5	Want to be [more] productive; Need to get to event / class / appointment on time; Move for sport; Not being productive and doing nothing	"... if I'm [feeling] the urgency to [move], it's like "ah!". You know that, "prom is about two months away, I need to get started and get in shape now - gotta fit into that dress." (9/27, A) "... I wanted to begin, cleaning my room, reading my book for a class, [I was thinking] "I'm awake, I should be moving", but, because I was, hung over and confined to my bed, where I needed my eyes to be closed and a pillow over my head, I couldn't satisfy the urge to move and get stuff done." (9/27, A)
7	Temptation	A desire that conflicts with something "you should do" or a value that you have	1	Sometimes, but not always, giving into cravings	Participant C: "I only crave rest right after I wake up, because I feel that as soon as I get going in the day its fine. If I actually get myself up, the craving for rest goes away. So, I will wake up and its, "Oh my god it's 7am. All I want is to go back to the bed. And then as soon as I go brush my teeth or something, I'm thinking, "What was I tired for?" and its fine. I woke up that way essentially, and the craving goes away, and I am fine for the rest of the day." Interviewer: "Have you, do you ever satisfy that craving, when your alarm goes off at 7:00 [and "I'm so tired"]..." Participant C: Absolutely [laughs]. Interviewer: "...and then you go just go, like "I'm not doing this" and you go back to bed?" Participant C: "Sometimes, yeah..." Interviewer: "Okay." Participant C: "...but if I like actually get myself up it goes away." (9/21, C)

TOTAL = 87

* These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTs, but efforts were made to place unique quotes only into 1 (or two) HOTs.

1103

1104

Supplement 6. Super Higher Order Theme 5: Propelling and restraining forces

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Facilitators of movement	Internal and within the person's control AND External and within the person's control	40	Caffeine; Day off - want to go to gym; Environment / being outside; Music - beat and/or lyrics; Music - puts you into a good mood; Social media / gym selfies / motivational videos; Video game - excitement / adrenaline rush; Wearable fitness technology	"For me music is what impacts my urge to move or rest, because if it's slow, sad music I just wanna chill, and go for a drive or something, but if it's up-beat I will dance or [laughs]...or I will go work out..." (9/21,D) "I have a lot of friends on social media who will post gym selfies, and when I see those I'm feeling like, "Ah, look at them. I should probably do that!" That's an outside factor that potentially pushes me to want to move or do what they are doing. It never really happens, but definitely I mentally get that, but not physically." (9/27, A) "I used to play basketball and soccer in high school so when we had a dope mixtape before a game, I always felt, "Let's get hyped. Let's go into this." Whereas, sometimes my coach would play country music, and no one wanted to do the [sport drills], because it was country music, [and] how are we supposed to hype up? If you don't like the music, how are you gonna do anything? I had a teacher who used to play country music, and we'd say, "You gotta change the music, we're not doing anything." (8/31, B)
2	Deprivation / satiation	Scarcity of movement or sedentary behaviors compared to excess and "fullness"	32	Been sitting a long time; Too much sitting; Wanted to move around after a long, 7-hour road trip; Was sitting two hours; Move after sitting in class; "Cooped up" during winter; No exercise / training for an entire week (e.g. Spring break); No exercise the previous day; Lack of sleep and need to recover; Physiological deprivation of sleep (don't get the 8 hours needed); Sleep deprivation; Already rested; Fully rested; Just exercised; Already moved a lot	"...there are other days where it's a craving to the point where, you're dying to get a hard workout in - you really miss it and wanting to train and push yourself." (9/17, A) "[On] those days that I go to bed at midnight and then wake up at 6am I just want to go right to sleep right after class." (9/10, A) "I think I have the urge when something is going on in my life where I just need to get out, and I need to run if I have been sitting for a long time. I need to just run on vacations. We would always stop at a rest area for a road trip, and I would literally just get out because when I was little I'd just run to the playground. I needed to run because I craved moving because I was in the car for about 10 hours." (8/31, D) "... after a long time of movement you want to rest, but [after] a long time of resting, you don't want to get up and you know, run two miles." (9/8, A) "Over the past week I have wanted to rest more than usual. We had a pipe burst in the dormitory so I was up for about 5 hours from 11pm to 4am. I was dying because I was on my feet for

					that extreme period of time. I wanted to recover but haven't been able to so that experience really made me want to just lay down and not do anything." (9/21, A)
3	Barriers for movement	Conditions and situations internal to the person, NOT in their control	31	Illness; Pain causing dread of movement; Surgery; Injury – can't move; Poor diet; Feel stuck / trapped	"Craving rest - I would probably say for me the only time I really feel like that is when I'm sick or something like that. When I had COVID-19 at the beginning of last year I just felt run down. I was thinking, "All I want to do is just rest". I had ample time to do so. I was stuck in my place by myself [quarantining], but that was a craving where it felt like an itch that needed to be scratched. It couldn't be pushed off." (9/17, A) "I have problems with my knees, so I'm kinda scared of starting." (9/8, A) "Last summer, I [had] cataract surgery and the recovery period was longer than I expected, and since my procedure was [more complicated] I had to sit in bed and get help to walk to the bathroom for a week. And I couldn't drive my car for three weeks, and I couldn't lift anything over twenty pounds for two months, and I just wanted to move so badly, but especially that first week, because I literally couldn't even go up and go walk around the house or anything..." (9/17, B)
4	Social influences	Effects of people, lack of people, and social situations	30	Social influences; Social reasons; Social pressure; Watching others move or be sedentary; Friends / Peers / Significant others; Coaches and peers pushing you; Too much interaction with others – want to rest; Social media; Effects of isolation; Being alone; Seclude self from people; Too much socializing; Long day at work and want to be alone; Vicarious experience	"I have very high social needs, and so I feel that if the people I'm around are all going to be active, then I feel a need to do that too because ... that's not how [I] fit in, but that's how I can be with them, and get my social needs and interaction for the day." (8/31, D) "There's definitely moments of time where I am in my dorm room thinking, "oh man". I'm just studying, doing my work, but I feel that I can be with my friends. We're having a great time, but then my social battery runs out and I'm thinking, "oh, I should probably get some rest" for the next day." (8/31, B) "We'll finish a game, [maybe] the next day we have off, I'm like "oh, I wanna go to the gym". He's like, "I'm wiped out from yesterday, I don't wanna go to the gym", and sometimes, him not wanting to come with me, that makes me like "eh, well do I really need to go?", it makes me, often times I still will go anyways but it definitely gives me more of a hesitation than if he's like, "yeah let's do it" then, it's "boom, let's go right away". (9/17, A) "When I get overwhelmed, I prefer to rest and just being alone resting." (9/10, C)
5	Conditions	Conditions and situations external to the person,	29	Weather; Good weather is refreshing and promotes good mood; Bad weather - afraid you might slip or not be safe;	"The weather is something that definitely urges me to move. Morning sunrises or evening sunsets - those are definitely something that urges me to move, go on runs or walks because,

	NOT in their control		Bad weather puts you in a bad mood; Hot weather - instigates wants to stay inside with comfort (A.C.); When forced to be outside in bad weather, go faster to get inside sooner; Conditions must be right; COVID-19 quarantine; Too crowded	obviously for the scenery, but the breeze as well. It's a pretty scene to see." (9/13, A). "I feel that want and desire is when I want [to move] but can't because I have responsibilities at home. That's mostly when I watch my nephew after school or on weekends. (8/31, B) "If I do the exercise it depends on where I am at. If I am in my room and there is no one around and I have time, absolutely, I will bring out my yoga mat, and I will [exercise], but if I am in the dining hall, I can't instantly act on my desire to move." (9/27, A) " ... back to cheerleading, we weren't allowed to stop, because of COVID-19, [so] we weren't able to, do that, and that's something that I did a lot during high school was [stunting], so I always had an urge to want to, [stunt] and put people up in the air but I wasn't able to..." (8/31, C)	
6	Liking / reinforcement	Rewards and pleasure from movement and sedentarism	17	Enjoy exercising; Hedonic pleasure/ liking; Desires are related to enjoyment; Like to move (feel refreshed); Like the post workout "after glow"; Movement has psychological rewards; Moving felt really good so want to keep moving; Wanting the adrenaline high from movement; Joy of movement; Reward after accomplishment	"What makes me want to move is just the joy I get from playing sports. I enjoy exercising [and] definitely feel motivated..." (9/17, A) "Soccer playing and training is the most enjoyable part of my day." (9/17, A) "Moving and walking outside is mentally refreshing." (8/31, D) "I really enjoy starting my day off because then I feel like really refreshed, so I guess, in the mornings I really wanna be active." (8/31, D)
7	Immersion	Flow states of high focus	5	Highly focused on the desire during craving; Engaged with interview (i.e., flow state); Engaged; Have a strong interest in a sedentary activity (like interesting schoolwork)	"I am pretty engaged with this interview right now, so I don't feel the need to move." (8/31, A) "If I am studying I don't feel the need to move because I am doing something that interests me." (8/31, B) "If I am distracted, such as studying, and I am completely immersed in it, then I won't feel the need to move around. I will rest for a little bit and do what I need to do." (9/10, A)
8	Distraction	Lack of focus	1	Paying attention to other things	"... if I'm aware or bored, then I just wanna start moving around. So if I'm in a lecture, and I'm completely bored, I wanna start getting up and moving. I'm distracted." (8/31, A)
			TOTAL =		
			185		

* These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTS, but efforts were made to place unique quotes only into 1 (or two) HOTS.

1105

1106

Supplement 7. Super Higher Order Theme 6: Stress and boredom

#	Higher order theme (H.O.T.)	Explanation	L.O.T.s attributed to this H.O.T. (count) *	Exemplar L. O. T.s **	Exemplar Quotes ***
1	Demands	External factors impinging on the self	52	Overworked Being overloaded; Heavy demands - very busy; Heavy load, overworked; Busy schedule; Studying; Too busy to move / exercise; Too much traveling; Increased life demands; Demands from training / sport; External regulation - sports training; Increased training load / workload; Situational demands: "have to" study, "have to" go to bed; Want to rest, but can't : have to keep working in the lab; go to practice; Period of focusing really hard: academic class or homework (mental challenges); Move - job responsibilities; Lack of breaks / recovery; Want to keep exercising, but not physically able; Decreased demands; Coming home from work and now want to rest; Just want to lay in my bed - had a long week	"I have had a jam-packed day full of stuff, and I am going to be going until 11pm - so it's a bit more like jolty, anxiety movement. I want to kick my foot around a little, or shake a bit, just to get rid of that nervous energy, in terms of moving, in terms of exercise or working out." (9/27, A) "When I used to cheer there was a week we have practice every single day, and then we ended with two competitions, and they didn't end well. They were really bad, so at the end of the week you're just craving to rest and sleep, and mentally drained too, versus, "Oh, I had practice this week, and I'm tired at the end of the weekend - I want to rest." (8/31, C) "One of my classes got cancelled and moved online, and then I didn't really have much to do - so today was more of a lazy day for me. I took a nap." (9/21, A) "I really wanted to go get a good workout, and I was all prepared. I was, "okay, I'm gonna go work out for an hour, get a good run in, lift some weights" and just feel really good about myself, and then I realized how much work I had to do for school, and I just can't leave. There's not enough time in the day to do both, so I had to make the decision to stay in my dorm and work on stuff - stuck at my desk ..." (9/21, A) "I just wanted to rest, but of course I was unable to." (9/15, A)
2	Physical sensations	Psychosomatic sensations, like energy and fatigue	37	Physical sensations; Urges feel physical in nature; Urge is physical / of the body; Differences between physical and mental sensations; Tired; Just woke up; Exhausted / exhaustion; Feelings of energy; Bursts of energy;	"... The urge to rest is more of a physical thing [like feeling] really tired from walking all day. My body feels forced to rest." (9/17, B) "The desire to rest is more motivated by my body and how my body is feeling and the desire to move is more like a mental thing." (9/17, A)

				Want to expel excess energy; Adrenaline rush after moving; Feel a tension that you want relieve from, and will move to get rid of tension; Feeling antsy now; Feeling jittery; Feeling groggy; Over-eating (feel gross, which is stressful); Nauseous / dizzy (due to hangover); Observable manifestations (drooping body, stop talking); Urge - fidgeting, twitching starts; Nervous / jittery	"I just walked here, and I got a 20 minute walk in - so I am just very energetic right now." (9/10, A) "I get like random bursts of like energy, and it makes me really motivated, and it like makes me want to get more done, and it makes me wanna go on runs, go on walks, get more homework done, or get the next week's homework done." (9/13, A)
3	Stress	Deviations from homeostasis	32	Stress; Stressful situations (unexpected, uncontrollable); Stress (of the interview); Stress (preparing for exam, speech); Stress could make you less or more active; Stress activates too; No motivation to either move or rest - due to stress - possibly conflict; Stress stimulates motivation states like craving; Excitement of competition and winning; Strong desire to move at football game - exciting atmosphere - winning the competition; Overstimulation - a lot of excitement; "Stressed out" and overwhelmed; "Stressed out" / overwhelmed / emotional exhaustion due to concerns about past and future; Urge to move and/or rest when stressed out; Coping / dealing with the want to rest; Stress and disappointment; Feel highly agitated and frustrated; aggravating, annoyed or stressed; because can't satisfy the urge	"Stress makes me want to move, but if it's too much there's a certain point where ... if I don't have any breaks to sit for a minute ... then I feel like I need to go home and rest at the end of the day." (9/17, B) "When I get stressed I am "Go! Go! Go!" I get these bursts of energy. Sunday night I was super stressed, and so at 10pm I just cleaned my entire dorm room, my bathroom, my bed, my closet, refolded everything. I am the exact opposite of most people who will get down and be like, "oh, I'm just gonna go lay down, chill out." I am, 'Let's do 40 tasks right now". (9/21, C) "When I am feeling stress or anything like that, always, working out is what I turn to. I will skip something else in my day to get a workout in. If I am really feeling overwhelmed or stressed or whatever it is ... because I know how much [exercise] alleviates that [stress] for me" (9/17, A). "I think my [desire to rest] is related to stress. If I get really stressed out, my brain will shut off, and I just need to sit and not do anything. Otherwise, if I am thinking too hard I am not doing the work correctly because I am overthinking. So [my desire to rest] is normally about stress and if I am freaking out I just need to sit down." (9/21, C) "I tend to shut down when I get stressed or overwhelmed." (8/31, C) "I couldn't satisfy the urge to move and get stuff done, and that was very stressful. It was annoying,

					and I was saying to myself, "Why won't this go away!" (9/27, A) "There's just no motivation, and I am just stressed." (8/31, C) "...during basketball we'd be in the gym for hours every day, going home at 8pm and then the games - there was always the game that you lose. Sometimes it is not that big of a game, but sometime it could be a state championship, and you just crave rest, mentally and physically. You've put in so much effort, just to lose." (8/31, A) "There are times when I don't wanna face it, but then when I do face it, it all hits at once, and I get completely overwhelmed by it. I just need to like take a seat, and just reset myself, maybe go on my phone for a good little bit, go on a walk, and, I used to walk out of my house, if I had to... go on a walk around the neighborhood." (8/31, A)
4	Exhaustion threshold	Point at which fatigue has a substantial effect on motivation states and behavior	32	State of exhaustion; Mental exhaustion; Physical exhaustion; Being "run down"; Brink of exhaustion; Exhaustion resulting in cravings; Overpowering craving for rest and sleep due to heavy socializing; Exhausted from constant traveling and just want to rest; Exhausted / overwhelmed; Stimulus overload; Fatigued	"..When I reach the brink of exhaustion, that's when I personally wanna rest as a college student, because my day's just so jam-packed with meetings and classes ... What makes me wanna rest is when my body is just so exhausted I can't continue anymore..." (9/27, A) "I am just too tired. I have wanted to be active, but I just don't always have that energy." (9/10, A) "When I am exhausted, that is when I literally can't anymore. I need to just lay down. At the end of the season where I have been training, forever, and mentally racing - it's very mentally taxing. So it's when I'm exhausted and physically and mentally exhausted where I just crave a break and rest. I think that's when I [have] the highest amount of urge." (8/31, D)
5	Monotony / Boredom	Sensations of being underwhelmed, under stimulated	12	Need for change; Need for stimulation; Boredom; Monotony / high repetition; Boredom results in / triggers desires to move; Bored;	"What makes people want to move is a change after doing the same thing over and over which can be monotonous for a person and a little boring." (9/10, B)

				Bored with current activity; Would be more bored with rest / sedentarism	"I think that on a global scale, what makes people want to move is a change after doing the same thing over and over which can be monotonous for a person and a little boring. Maybe that change of movement could [result in] the after-effects of just moving the body" (9/10, B) "For me, something that really does make me want to rest is when I'm doing something repetitive." (8/31, B)
6	Emotion regulation	Ability or capacity to modulate feelings	11	Alleviate stress; Reducing stress; Move to combat stress; Clear mind / emotional stability; Clear mind and thinking; Feeling aggravated; Feeling frustrated; Bad mood results in cravings; Move for a better mood; Feel a need to relax and focus	"I notice on days that I am not active I am emotionally a lot less stable. [Activity] helps stabilize that. If I am absent [mentally] and all over the place [mentally] I think, "did I do anything today?" And then I exercise and it resets me and I can face anything." (8/31, D) "... When I move around, it kinda clears my mind because I think a lot. So going to the gym or going on a walk just really helps me mentally...So I think that's what makes me wanna move..." (9/21, B)
7	Mood / emotion	Positive or negative feelings and mood conditions, varying over a period of several hours	3	Good mood promotes desires / wants; Move when in a positive mood state; Feeling upset about trauma results in motivation states to exercise; Feeling depressed and "bad frame of mind" results in wanting to lay in bed; Feeling negative mood about body image problems leads to desires to exercise; Feeling agitated and/or annoyed	"I want to move normally when I have those days where I wake up in a really good mood. I want to move and get everything done and walk around more, run, exercise, etc." (9/13, A) "I experience desire when I struggle with my body image. Rather than doing something drastic in a negative way, like changing how I am eating, I would rather exercise because it is a healthier option. I do a healthy amount of exercise when I feel bad about myself and I don't over-exert myself." (9/17, B)
8	Dysfunction	Deviations from homeostasis that result in conflicting signals and impaired ability to act as intended	1	Hungover; Mania related to bipolar disorder / hyperactivity	"I was a bit hungover, and I was stuck to my bed because I was a bit nauseous but, I [couldn't] fall asleep. [I thought] "If you can't rest, you should be doing something", and, it was very, annoying because I wanted to begin, cleaning my room, "I'm awake, I should be moving", but I needed my eyes to be closed and a pillow over my head, I couldn't satisfy the urge to move and get stuff done, and that was very stressful." (9/27, A) "It would be similar to an urge I guess too. I have bipolar disorder so it makes me manic at times, so

that fuels that [desire/want] if I am manic. I guess that makes me different from most normal people as they want to move, or have an urge to move, but I kind of have to move." (8/31, A)

TOTAL =
180

* These are the number of LOTs originally attributed to this HOT theme by analysts. During stages of re-review, some LOTs were reassigned to different HOTs for coherence, which may slightly change the quantity of LOTs in the following column.

** Many LOTs can (and may be) cross loaded onto other HOTs.

*** Many quotes can be cross loaded onto other HOTs, but efforts were made to place unique quotes only into 1 (or two) HOTs.