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A PERSONALIZED VALUES INTERVENTION TO INCREASE HEALTH BEHAVIORS IN COLLEGE STUDENTS

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**A PERSONALIZED VALUES INTERVENTION TO INCREASE
HEALTH BEHAVIORS IN COLLEGE STUDENTS**

A Thesis

Presented to

the Faculty of the Department of Psychology

Murray State University

Murray, Kentucky

In Partial Fulfillment

of the Requirements for the Degree

of Master of Science

By Jessica Criddle

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Abstract

College students in the United States face unique health risks such as problematic alcohol use, poor nutrition, low sleep quality, and low rates of exercise. Research increasingly shows interventions utilizing individualized approaches lead to longer term pro-health behavior change. Values-centered Acceptance and Commitment Therapy (ACT) is a useful framework to for development of personalized, effective interventions. One reason for this may be that impersonalized interventions and researcher-generated target behaviors common in other literatures may not hold the same evocative effect and connection to health behaviors for each or every participant. In ACT, valuing increases the probability of values-consistent behavior, such as engagement in health behaviors, by increasing their reinforcing properties. This investigation sought to explore health valuing with innovative, values-focused methods applied to a group level intervention. Specifically, this study replicated the use of multiple domain-specific outcomes of previous work (Stapleton et al., 2020), extended valuing interventions with the use of clinical tools (Harris, 2008; Wilson & Sandoz, 2010), and failed to replicate findings in previous work using ideographic motivational statements (Jackson et al., 2016). While this intervention did not generate significant improvement in health behaviors relative to a control intervention in 74 participants, this study has implications for future digital health intervention design and implementation.

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A Personalized Values Intervention to Increase Health Behaviors

College students in the United States face significant health risks (Lawrence, 2017; University of Minnesota, 2015). Namely, problematic substance use, poor nutrition, low sleep quality, and low rates of exercise. Alcohol, tobacco, and drug use are prevalent in this population (Lawrence, 2017; National Institute on Drug Abuse, 2019). Additionally, up to 57.9% of college students may have a sedentary lifestyle and many can be classified as overweight (22.2%) or obese (15.9%), factors which contribute to a variety of health conditions (American College Health Association [ACHA], 2021). Many students also have diets that do not meet national nutrition standard and report sleep patterns and quality that do not foster health (Adams et al., 2016; Becker et al., 2018; Lederer & Oswalt, 2017). Further, only 40% of nationally survey college students estimate that their health is good (AACU, 2021).

Problematic health behaviors in this critical period of development may lead to poor physical health and behavioral health problems in later years. With dietary concerns for instance, disordered eating typically begins in adolescence to early adulthood, with eating patterns often predicting those in adulthood (Calam & Waller, 1998). A recent meta-analysis showed 70% of those obese in adolescence will be obese over the age of 30, which is associated with a variety of unfavorable health conditions (Engeland et al., 2004; Reilly & Kelly, 2010; Simmonds et al., 2015). Exercise patterns are also relatively

stable over the course of one's life, demonstrating the important of early physical activity (van der Zee et al., 2019) Additionally, early heavy substance use predicts later substance abuse disorders, a worrying fact when considering higher levels of alcohol and drug use in the college population (Gray & Squeglia, 2017). While attainment of a college degree predicts overall less health risks in later life, it is vital to establish good health practices that predict health behaviors in later adulthood.

Given the many unhealthy behavior patterns in college students, it is essential to develop accessible resources and interventions for health in the college population. Many prevention approaches and interventions have been developed to address these health risks. Public health approaches often utilize free resources such as health screenings and community health literacy, as low health literacy has been shown to correlate with poorer health outcomes (Fan et al., 2021). Yet, informational interventions with health outcome facts typically do not result in significant behavior change unless given in one-on-one clinical settings (Conn et al., 2011; Kahwati et al., 2016; Ross & Melzer, 2016; Viswanathan et al., 2012). Two recent systematic reviews show that more effective informational interventions are more likely to intervene using multiple simultaneous strategies and individualized intervention aspects such as behavioral counseling, self-reflection on motivation, and self-affirmation (Agency for Healthcare Research and Quality, 2011; Heath et al., 2012; Sheeran et al., 2017). An individualized approach is demonstrated in exercise science research exploring motivation in line with the psychological theory of self-determination (Flannery, 2017; Friederichs et al., 2015; Gourlan et al., 2015; Teixeira et al., 2012). While extrinsic motivation for health (e.g., financial incentives through one's workplace) impacts initial behavior change, higher

levels of behavioral engagement and long-term behavior change (Curry et al., 1991; Kane et al., 2004; Teixeira et al., 2012; Webb & Sheeran, 2006) are correlated with intrinsic health motivation and personally chosen behavioral intentions (e.g., challenging oneself). Such interventions may include motivational interviewing and programs or smartphone applications (apps) with tailored feedback (Lustria et al., 2013; Morton et al., 2014). Recent trends in health research are exploring apps with personalized feedback and practitioner-led personalized medicine to increase preventative health behaviors, further individualizing interventions (Buford et al., 2013; Ghanvatkar et al., 2019).

Studies and metaanalyses also demonstrate significant health behavior change from values-centered studies, indicating the efficacy of personalized interventions focusing on motivation (Epton et al., 2015; Steele, 1988). There are correlates between these aspects of health and health behavior associated with meaning in life and values. Values-based interventions have been used to improve elements of health in college populations to increase health such as acceptance of health messages (Harris & Napper, 2005) and pain tolerance (Branstetter-Ross et al., 2009; Sakano et al., 2021). Meaning in life has been shown to correlate with physical activity, sleep quality, and lower rates of alcohol and drug use (Csabonyi & Phillips, 2017; Hooker & Masters, 2014; Hooker et al., 2020; Kim et al., 2015). Despite these relationships, there has been limited attention given to values-based health interventions for the college population. One useful framework to for development of interventions to increase healthy behaviors and reduce unhealthy behaviors is Acceptance and Commitment Therapy (ACT).

ACT and Valuing

ACT is a third wave behavioral therapy which is the practical application of the assumptions of Relational Frame Theory (RFT). RFT is an extension of traditional behavior analytic theory which explains language and cognition through relational framing, connecting an individual's learned relational responses to possible future behaviors (Hughes & Barnes-Holmes, 2016). A central aim of ACT is not to reduce human suffering, as suffering is assumed to be a normal aspect of the human experience, resulting from normal operations such as those producing verbal events (Fung, 2014). Alternatively, ACT-based approaches seek to change a person's relationship with suffering and self (Wilson & Murrell, 2004) and to imbue life with meaning through mindful actions in line with one's values (Harris, 2019, pp.189; Hayes, Strosahl, & Wilson, 2012). In ACT, psychological events are theorized to be interactions between an individual, their learning history, and current situational contexts (Hayes, 2004). As such, the context in which a behavior occurs is central and manipulation of or change in context is what allows for change in behaviors such as thinking, feeling, and overt behavior. The overarching model for this change has been coined psychological flexibility (Hayes et al., 2006). Psychological flexibility entails acceptance and awareness of one's own thoughts, feelings, and emotions, and working toward living in line with values even in the presence of aversive contingencies (Hayes, 2004; Hayes et al., 2012b, pp.96-97). The six core processes of psychological flexibility are contacting the present moment, defusion, acceptance, self-as-context, values, and committed action (Harris, 2019, p. 5). Present moment awareness entails contact with internal and external stimuli in the present moment, and it is a central component of mindfulness. (Plumb et al., 2009). Self-as-context is a process of perspective taking applied to the self, wherein one can

separate from and notice internal experiences (Harris, 2019, p. 7). Defusion allows for deliteralization of thoughts rather than efforts to eliminate thoughts and feelings one experiences as “real” or “true” (Hayes et al., 2006). Acceptance involves allowing the presence of negative thoughts and feelings instead of fighting them (Harris, 2019, p. 7). Values provide meaning in life and direction in the use of the other processes, while committed action refers to patterns of successful behavior associated with personal values (Hayes et al., 2012b, pp. 93-96).

Each of these processes allows for better use of other processes, interacting to contribute to flexible responding aligned with valued living. In ACT, values are theorized to be “freely chosen, verbally constructed consequences of ongoing, dynamic, evolving patterns of activity, which establish predominant reinforcement for that activity that are intrinsic in engagement in the valued behavioral pattern itself” (Wilson & DuFrene, 2009, p. 66).” To expand, this definition proposes that valuing changes the reinforcing qualities of the consequences that will follow certain activities (Smout et al., 2014). Unlike goals, which can be completed (Chase et al., 2013; Finkelstein-Fox et al., 2019) valuing is an ongoing process (Hayes et al., 2012b, pp. 94). Values are constructed on a moment-to-moment basis and change over time, as engagement with valued action will influence one’s future construction of valuing in the same area. These valued actions are reinforcing in and of themselves, with behaviors under appetitive instead of aversive control (Smout et al., 2014), wherein behaviors under appetitive control are engaged in due to potential positive reinforcement and those under aversive control are organized by possible punishment or negative reinforcement. Engagement in valued behavior also broadens one’s behavioral repertoire, leading to expanding patterns of behavior which

allow for increasing engagement in even more valued actions (Louisiana Contextual Science Research Group, 2022).

From a behavior analytic approach, valuing is an instance of rule-governed behavior, which is controlled by verbally mediated consequences, as opposed to behavior shaped by environmental contingencies with which we come into direct contact (Törneke et al., 2008). Hayes (1989) proposes three classes of rule-governed behavior: pliance, tracking, and augmenting. Pliance is defined as behavior controlled by socially mediated consequences, where another organism delivers the consequence. This directly connects the rule (a “ply”) and the behavior that will result in those consequences (Kissi et al., 2017). Pliance may also be mediated by self-established rules with socially mediated consequences such as social approval (Törneke et al., 2008). For example, a person may go to the gym because of their friend’s workout, and they receive social acceptance and praise by doing so.

In tracking, the correspondence between the rule and the contingencies in the natural environment govern the rule (a “track”), rather than dependence on another to deliver the consequence. A hiker may begin weight training after reading an article extolling its benefits for trail endurance and would then see the desired improvements; this behavior could be categorized as tracking.

As opposed to rules specifying contingencies present in plies and tracks, a rule is considered an augmental when it establishes or alters the effectiveness of a previously established consequence (Kissi et al., 2017). A formative augmental will transform previously neutral stimuli into stimuli with reinforcing or punishing qualities that influence behavior (“augmenting;” Zettle & Hayes, 1982). For example, a university

employee may know about a daily employee walking group, yet this previously meaningless activity may be established as a reinforcer when learning about a program rewarding attendance with financial incentives. Similarly, a motive augmental will temporarily change the strength of an established consequence (Zettle & Hayes, 1982). One example of this may be someone considering an additional day of gym attendance after reading that the gym may be a good way to make new like-minded friends.

Augmentals have the additional quality of being verbal behavior, as these rules are verbal stimuli that specify the related contingencies (Hayes, 1989). Augmentals are conceptually linked to behavioral principle of establishing operations (EOs), which temporarily increase or decrease the effectiveness of reinforcers and punishers which with one comes into direct contact (Michael, 1993). Inherent in this conceptualization, motivation by aversive control, such as engagement due to avoidance of social punishment or missing out on access to reinforcers that we may see with plys, is not congruent with an ACT conceptualization of valuing (Plumb et al., 2009).

Relational Frame Theory (RFT) can add to our understanding of rule governed behavior with regard to values. Values can be conceptualized as verbal EOs consisting of verbal statements regarding patterns of overt behavior that are meaningful to the individual. One function of verbal valuing statements is value altering, increasing the reinforcing strength of behavior engagement (Cooper et al., 2007, p.707). These statements also have an evocative function, increasing the likelihood of behaviors in a frame of coordination with the value statement (Barnes-Holmes et al., 2002, p. 105; Whelan & Barnes-Holmes, 2004).

Additionally, RFT posits that rules may be self-generated, as one can verbally construct possible future consequences that may be distant or non-experienced (Fryling, 2012; Hayes, 1989; Hayes et al., 2001). Hebert et al. (2021) extend this theory by conceptualizing values as EOs “making a stimulus that was previously avoided (i.e., functionally aversive) into one that is approached (i.e. functionally appetitive; para. 52),” allowing one to access healthy, appetitive behavior choices even in difficult situations. This can be seen when an individual engages in valued behavior even when there is no obvious direct reinforcement in the moment. One example of responding in such a context is going to the gym and exercising even while directly experiencing aversive contingencies such as self-consciousness due to being unsure of how to use equipment.

Self-Efficacy

Self-efficacy is the belief that one is competent to effect change and is often conceptualized as a mechanism by which change occurs (Sherer & Maddux, 1982). Self-efficacy research often attributes approach behaviors to beliefs in one’s efficacy, mainly based on research correlating these beliefs with behavioral outcomes (Samendinger et al., 2019; Sitzmann & Yeo, 2013). However, the outcomes shown from many of these studies can be explained by basic behavioral principles without the inference of an abstract construct (Borkovec, 1978). For example, increasing approach to feared stimuli in a hierarchy based on current self-efficacy is essentially an extinction procedure (Bandura, 1977; Hawkins, 1992). In much the same way, vicarious experience and verbal persuasion, often used to manipulate levels of self-efficacy in experiments, are both forms of learning, as humans can establish rules and self-statements without direct experience of contingencies (Bartsch et al., 2012; Fryling, 2012; Wright et al., 2016). A

behavior analytic analysis of self-efficacy suggests that contextual factors are involved in the relation between self-efficacy and behavioral outcomes rather than causal behavior-behavior relations (Biglan, 1987). In line with an RFT framework, verbal predictions about one's success may correspond to behavioral outcomes by relating contingencies of reinforcement (Biglan, 1987). Performance mastery of target behaviors has been shown to increase self-efficacy, suggesting that motivation to contact the reinforcing properties of a behavior is what drives behavior change and self-efficacy ratings are a consequence (Bandura, 1982; Hawkins, 1992). It has even been argued that self-report of efficacy related to target behaviors is related to motivation rather than ability beliefs, possibly linking self-efficacy to motivating operations seen in behavior analytic literature and intrinsic motivation seen in exercise science literature (McAuley et al., 1994; Michael, 1993; Williams & Rhodes, 2014).

Despite these possibilities, it is important to include self-efficacy in research exploring health outcomes because of the vast amount of literature linking the two, and to then draw conclusions based on the results of analyses and their interpretations. Domain-specific self-efficacy has been linked to multiple areas of health explored in this study (Miao et al., 2016). For example, exercise self-efficacy is related to increasing or higher levels of physical activity short-term (Buckley, 2014; Litman et al., 2015; Middelkamp et al., 2017; Wada et al., 2019). Although findings have been inconsistent, many study have linked self-efficacy to diet adherence for weight loss and chronic health conditions, and behavioral strategies for diet adherence have increased dietary self-efficacy (Linardon, 2018; Prestwich et al., 2013; Warziski et al., 2007). Associations have also been found between high self-efficacy and lower rates of cigarette and use, though some studies are

correlational and in others domain-specific self-efficacy followed substance use behavior change or intervention (Jones et al., 2020; Karatay & Gurarslan, 2017; Metcalf et al., 2018). Self-efficacy is associated with other substance abuse behaviors, such as lower levels of alcohol use (DiBello et al., 2019; Miller et al., 2019; Noyes et al., 2018).

Valuing in Research

Evidence Supporting ACT

Given the focus on valued action as an outcome of ACT, the success of such treatment informs and necessitates a more molecular focus on the valuing process. A recent metanalysis of a meta-meta-analysis demonstrates the efficacy of ACT for a wide array of target disorders (Gloster et al., 2020). Gloster and colleagues (2020) reports that ACT frequently has better outcomes than waitlist, placebo, active treatment (excluding cognitive behavioral therapy; CBT) controls, and treatment as usual (current accepted standards of treatment for a condition), and that ACT has similar outcomes to CBT. Metanalyses and systematic reviews of randomized controlled trials support ACT for anxiety, depression, addiction, and somatic health problems (A-Tjak et al., 2014; Hacker et al., 2016; Lee et al., 2015; Yildiz, 2020). Additionally, ACT interventions lead to increased quality of life with serious health conditions, healthy eating patterns and body image, weight management, and increased physical activity (Li et al., 2021; Linardon et al., 2018); Yildiz, 2020. ACT is frequently found to outperform control groups, waitlist, and treatment as usual, and is often found to be as effective as cognitive behavioral therapy in addressing psychological and behavioral health concerns (A-Tjak et al., 2014; Bricker et al., 2021; Hacker et al., 2016; Juarascio et al., 2010; Ruiz, 2012).

Over 900 individual randomized controlled trials show ACT to be effective in increasing physical health and ameliorating psychological and behavioral health difficulties (Association for Contextual Behavioral Science, 2022). Group and individual ACT sessions can improve sleep quality and quality of life with chronic pain (Lappalainen et al., 2019; Rickardsson et al., 2021; Vasiliou et al., 2021; Zakiei et al., 2021). ACT can promote health eating behavior, sustained weight loss, and physical activity (Bricker et al., 2021; Ivanova et al., 2015; Järvelä-Reijonen et al., 2018; Juarascio et al., 2010; Wallin et al., 2018). ACT shows improved behavioral health outcomes in substance abuse including nicotine, opiates, alcohol, and polydrug abuse (Bricker et al., 2013; González-Menéndez et al., 2014; Petersen & Zettle, 2009; Thekiso et al., 2015). ACT is effective in reducing symptoms associated with depression, anxiety, and borderline personality disorder, (Fiorillo et al., 2017; Kohtala et al., 2013; Morton et al., 2012; Pankowski et al., 2016; Sander et al., 2020; Spidel et al., 2017).

Values are treated differently across protocols in these trials, but they contain elements of exploring valuing as personally chosen life directions and not goals, identifying personally important valued domains, reflecting on current engagement with valued behaviors, guidance on and time for active reflection on what the participant might value, and connecting valuing to qualities of behaviors and corresponding actions (Harris, 2019, pp. 213-227; Levin et al., 2020; Wilson & Murrell, 2004). These elements are incorporated into respected clinical tools such as *The Values Worksheet* (Harris, 2008) which have been used as part of effective ACT treatment packages. Slowing down and imagining past or possible valued behaviors also provides direction for values

construction, as seen in tools such as the *Sweet Spot*, a clinical experiential intervention designed to allow clients to contact the valuing process (Wilson & Sandoz, 2010).

Correlational Values Studies

Values-specific studies show correlations between personal meaning and wellbeing, including physical health. Three recent studies have used technological means to collect EMA data on valuing as conceptualized in ACT, each demonstrating the dynamic nature of valuing and its role in psychological health. Grégoire et al. (2021) found wellbeing and distress were more accurately predicted by day-to-day valued actions than averaged valued living, and that higher daily variability predicted increasing distress over time. Finkelstein-Fox et al. (2019) and Berghoff et al. (2018) found that different psychological flexibility processes discriminatively predicted daily valued living, with the former showing day-to-day within-person variance in valued action as an indicator of daily psychological health. Several other studies demonstrate the role of purpose, meaning, and valuing in physical health (Czekierda et al., 2017). A sense of meaning in life has been associated with healthy eating and physical activity (Clemens et al., 2020), predicting sustained behavior change above and beyond ratings of importance (Brassai et al., 2015). Purpose in life has been shown to improve multiple dimensions of sleep quality and to be associated with higher levels of physical activity as measured by self-report and accelerometers (Hooker & Masters, 2014; Turner et al., 2017). Additionally, an increase of reported action in line with personal values after pain management treatment has been associated with increased emotional and physical functioning in those with chronic pain (Vowles et al., 2019).

Values Analog Studies

Several values-specific interventions have been implemented to improve physical and behavioral health outcomes. Most values-focused analogues have involved chronic pain and have shown outcomes similar to those using a comprehensive ACT approach (Branstetter-Rost et al., 2009; Smith et al., 2018; Vowles et al., 2019). For example, Páez-Blarrina et al. (2008) tested pain responses following two values interventions, one (ACT based) which explained pain as accompanying valued action, and one (described as cognitive) which explained pain as conflicting with valued action. Pain responses were tested again after adding a coping strategy to the interventions, cognitive defusion for the ACT group and thought suppression for the cognitive group. Those in the ACT group had increased pain tolerance compared to the cognitive values intervention at both timepoints.

Interventions targeting the college population have also been successful. Chase et al. (2013) found improvement in grade point average in those who read about valuing from an ACT standpoint and were asked to reflect on academic values before setting academic goals, an improvement not found in a goal setting only condition. A single session online web program implemented by Firestone et al. (2019) introduced college students to valuing as conceptualized by ACT and engaged them in experiential exercises. At a four week follow up period, participants showed increases in valued living across multiple life domains (e.g., citizenship, community).

Values analogues have also been conducted to evaluate their effect on physical wellbeing. Gregg et al. (2014) gave half of their participants an intervention based on a commonly used clinical values tool, asked them to write about their values and relate it to past and possible future valued actions. Those who received the intervention had lower levels of salivary cortisol levels after a social stress test, indicating that focusing on

valuing while acting may act as a buffer to stress. Lillis et al. (2021) conducted one 5-hour ACT based group therapy session with experiential exercises focused on values clarification, commitment to values, and acceptance and compared it to control and self-regulation skills sessions in a randomized controlled trial for those struggling with weight management. Both intervention conditions produced weight loss but only the values condition participants sustained health-related valued behaviors (e.g., minutes spent exercising) at follow up periods.

Many other ACT interventions also show that valuing mediates relationships with multiple predictors resulting in favorable outcomes (Michelson et al., 2011; Vowles & McCracken, 2008; Wallin et al., 2018; Wersebe et al., 2017). Component analyses of valuing as a mechanism of change are vital to predict and influence outcomes in research using process-based therapies such as ACT. Indeed, the recent Report of the Association for Contextual Behavioral Science Task Force on the strategies and tactics of contextual behavioral science research says, “applied research needs to identify, measure, and test functionally important pathways of change in their natural context,” citing technological dissemination and longitudinal studies as possible means to these ends. They also recommend experimental analogues with a personalized approach that link ideographic functional analyses and processes of change in order to discover manipulable variables that can be effectively applied to move behavior change in real-world settings.

Emerging Trends in Values Research

Two recent studies show promise in more personalized research regarding health values-consistent behavior. Stapleton and colleagues (2020) used health specific values to predict health outcomes in college students rather than using general valued living. A list

of 40 health-related values were used to create a deck of 40 values cards and mapped onto the Values Wheel, a clinical tool to assess client's behavioral alignment with values while weighting their personal importance (O'Connor et al., 2019). Participants first selected their five most important health values from the card deck and then used the Values Wheel adaptation to indicate how well they were living in line with these particular values. General values consistent living and psychological flexibility were measured using the Valued Living Questionnaire and CompACT, respectively. Outcomes included survey measures for physical activity (International Physical Activity Questionnaire; Craig et al., 2003), dietary quality (Diet Quality Tool; O'Reilly & McCann, 2012), sleep quality (Pittsburgh Sleep Quality Index; Buysse et al., 1989), alcohol consumption (Quick Drinking Screen; Sobell et al., 2003), and cigarette consumption (adapted from the National Health Interview Survey; CDC, 2016), all which areas are identified by the Centers for Disease Control and Prevention (2019) as key health components. All measures were given at one time point; a change in behavior was not examined and health values clarification was not utilized as an intervention. Health values consistent living predicted higher sleep quality but no other outcomes. General values consistent living predicted more physical activity and better sleep quality but not diet quality or cigarette and alcohol consumption. The authors concluded that abstract values were not enough to predict behavioral outcomes, and that value measurement and behavioral outcomes should match in specificity.

Another recent study (Jackson et al., 2016) sought to ensure a functional value-behavior relationship using a specific, pre-set target behavior participants' chose themselves (a university cycling class) while allowing them to state their own personal

motivation for said behavior. Participants rated a list of 24 common health and aesthetic related reasons why one might engage in physical activity and then constructed their own personal statement expressing what motivates them to exercise. Their own statement and 6 highest rated statements from each category were used to create an IRAP (Implicit Relational Assessment Procedure) unique to each participant. The IRAP (Barnes-Holmes et al., 2006) is a computerized procedure based on RFT's derived relational responding principle which allows for identification of implicit relational preferences, and results were used to validate the selection of values statements used in the experimental condition. Participants attended 10 cycling exercise classes and were given either a statement they had indicated was in line with their motivation for health (e.g., "to fit into my skinny jeans") or a statement containing an instructional message (e.g., "Push through your heels") with assignment utilizing an alternating treatment design. They found that when participants had a statement they rated as motivating presented to them their heart rate was significantly higher compared to presentation of an instructional statement and to baseline.

These findings mirror exercise science research indicating that intrinsic motivation increases intensity of exercise (Gardner & Lally, 2012; Teixeira et al., 2012; Wilson et al., 2004). It also reflects RFT's concept of valuing, as verbal establishing operations influenced behavior by connecting it to consequences. Further, motivational statements differed by individual, and the reinforcing consequences linked to these statements were often in the future not immediately present while cycling (e.g., "to fit in my skinny jeans").

Jackson et al. (2016) and Stapleton et al. (2020)'s methods have exciting implications for valuing studies, as survey measures assessing broad, abstract values do not steadily predict engagement in target behaviors (Barrett et al., 2019; Dahl, 2015). One reason for this disconnect may be that researcher-generated target behaviors may not hold the same evocative effect and connection to that value for each or every participant (Hayes, 2004). Additionally, one feature of valuing as conceptualized in ACT is that the reinforcer for valued behaviors is self-selected for its inherently reinforcing nature to an individual, rather than socially mediated through compliance with researcher expectations (Bond, 2004; Dahl, 2015). Researcher decided target behaviors and valued domains may induce participants to perform due to pliance (Kissi et al., 2017; Zettle & Hayes, 1982), and researchers should seek to mitigate some of this effect with design elements. An individualized approach such as in Jackson et al. (2016) can navigate some of these difficulties by having participants create a motivational statement that is more likely to be intrinsically reinforcing and encouraging them to connect target behaviors to their valuing in a functional manner. Most research on valuing to date has utilized traditional group level design, such as self-report questionnaires and an intervention applied to a group, despite the ideographic nature of valuing. Stapleton et al. (2020) and Jackson et al. (2016)'s studies establish techniques to make group level design more congruent with the nature of valuing by including individualized intervention elements and connecting valuing to one specific domain (i.e., health).

In particular, there are multiple ways to individualize participants' values and target behaviors in group designs. One of these is implementation of a front-end intervention to guide participants' engagement with values as freely chosen and not as

socially desirable (e.g., fusion with socially desirable values). A second method is narrowing down the valued domains to one domain associated with target behaviors (e.g., health) and keeping data from participants who rate this as highly valued (Stapleton et al., 2020). A third method is to broadly assess multiple target behaviors within a valued domain to explore participants' unique pattern of behavior change. Fourth, and most importantly, allowing participants to construct their own personal valuing statement around this domain instead of choosing from a researcher-generated list will assist in encouraging a more direct relationship between valuing and target behaviors. These methods allow this analogue study for short-term behavior change to examine the mechanism of action involved in such change and the utility of valuing interventions to potentially develop long-term intervention to disseminate to the general college population.

Current Study

This current study explored the influence of a previously validated valuing intervention on health behaviors in a college population. This was done through replication and extension of studies exploring health valuing with innovative methods (Jackson et al., 2016; Stapleton et al., 2020). Specifically, this study replicated the multiple domain-specific outcomes demonstrated by Stapleton et al. (2020) and replicated Jackson et al. (2016)'s procedure for generating ideographic motivational statements. In addition, this study extended the use of valuing intervention (Harris, 2008) to health-specific domains. Synthesis of these methods in this analogue study has the potential to inform research developing practical interventions in college populations to encourage increased health behaviors, including physical activity, dietary quality, sleep quality, and alcohol consumption.

Hypothesis 1: The intervention condition was hypothesized to show greater standardized improvements in selected health outcome of most personal importance relative to pre-post changes in the control condition.

Hypothesis 2: Changes in values awareness and engagement were hypothesized to mediate the relation between condition and the change score in selected health outcome of most personal importance, with participants in the intervention condition experiencing improvements in their chosen domain via the indirect effect of the valuing process. This analysis was primarily used to assess valuing as the mechanism of change involved in behavior change following the valuing intervention. It additionally provided information

on engagement with the intervention. Because ACT interventions elicit change through learning by direct experiences (such as the valuing intervention) and not psychoeducation, changes in valuing itself is more congruent with the ACT model than using attention checks to assess engagement.

Exploratory analyses were conducted to examine the difference between behavior change in a specific, personally important domain and behavior change across domains at the group level. It was expected that some domains of behavior would result in more change than others at the group level, or that some domains would not result in any change without consideration of personal importance. Results allowed for comparison in participant selected change targets in line with the ACT conceptualization of valuing versus researcher generated change targets, information which can inform future research and public interventions in specific health domains.

Research Question 1: The impact of the values intervention and control intervention across the health domains (i.e., physical activity, dietary quality, sleep quality, alcohol use, and cigarette consumption) was explored to determine if the values intervention leads to greater general improvements in health domains.

Method

Participants

Data were collected from a sample of students enrolled at a public comprehensive university in the Midwestern United States. Inclusion criteria for survey participation required participants be age 18 or older and have English language proficiency. The majority of participants ($n = 107$) identified as female ($n = 71$, 66.4%), heterosexual ($n = 84$, 78.5%), and white ($n = 91$, 85%). The average age of the sample was 20.3 years of age ($SD = 6.0$). Participants in the valuing condition ($n = 52$) and informational condition ($n = 55$) showed similar demographic characteristics.

Table 1
Demographic Variables at Baseline

| Characteristic | Whole sample n (%) | Valuing (n = 52) n (%) | Informational (n = 55) n (%) |
|---------------------------|-----------------------|------------------------------|------------------------------------|
| Gender | | | |
| Female | 71 (66.4) | 36 (65.6) | 35 (67.3) |
| Male | 31 (29) | 15 (27.3) | 16 (30.8) |
| Trans Female | 1 (0.9) | 0 (0) | 1 (1.9) |
| Trans Male | 1 (0.9) | 1 (1.8) | 0 (0) |
| Nonbinary | 2 (1.9) | 2 (3.6) | 0 (0) |
| Questioning | 1 (0.9) | 1 (1.8) | 0 (0) |
| Ethnicity | | | |
| Native American | 1 (0.9) | 1 (1.8) | 0 (0) |
| Asian | 4 (3.7) | 1 (1.8) | 3 (5.8) |
| Black | 9 (8.4) | 4 (7.3) | 5 (9.6) |
| White | 91 (85.0) | 48 (87.3) | 43 (82.7) |
| Bi-racial | 1 (0.9) | 1 (1.8) | 0 (0) |
| Other | 1 (0.9) | 0 (0) | 1 (1.9) |
| Sexual Orientation | | | |
| Heterosexual | 84 (78.5) | 38 (69.1) | 46 (88.5) |
| Bisexual | 11 (10.3) | 7 (12.7) | 4 (7.7) |
| Lesbian | 2 (1.9) | 1 (1.8) | 1 (1.9) |
| Gay | 4 (3.7) | 3 (5.5) | 1 (1.9) |
| Pansexual | 3 (2.8) | 3 (5.5) | 0 (0) |
| No Answer | 3 (2.8) | 3 (5.5) | 0 (0) |

N = 107

Procedure

All study procedures were approved by the university's Institutional Review Board (Protocol 22-030) before data collection commenced (Appendix A). Also prior to data collection funding was obtained through a university grant via the Murray State University Office of Research and Creative Activity (ORCA Grant MS #1129). After consenting to take part in the study, participants followed a link leading them to eight

psychometric battery measures which took thirty minutes to complete. Participants then continued to the intervention portion of the study. Random assignment to intervention condition (values-based or informational) was automated in the online open-source Lime survey platform. After intervention and control procedures, all participants selected the health domain of most importance to their own health from a list of domains assessed in this study (i.e., nicotine consumption, alcohol consumption, diet quality, physical activity, and sleep quality). Participants were then given an electronic debriefing statement providing information about the nature of the study.

Participants were then invited to sign up for ecological momentary interventions over text. Texting was initiated in waves for the entirety of two semesters of data collection, with participants receiving their first text the Monday following participation in the baseline survey and front-end intervention. During the 10-day intervention window, participants assigned to the intervention condition received a text daily at 10:00 am that contained their personally crafted motivational statement. Participants assigned to the informational control condition received texts each morning with information regarding a domain of health assessed in this study.

At the end of the 10-day intervention window participants in both conditions were presented with the same battery of questionnaires given at baseline, excluding the demographic survey. They then additionally completed a Program Evaluation to assess the perceived benefits and usability of the intervention. Participants were given an electronic debriefing statement providing information about the nature of the study.

CONDITIONS

Intervention Condition

Participants assigned to the values condition listened to a 4-minute audio recording during the initial study timepoint (Appendix B guiding them in the process of valuing as conceptualized in ACT, differentiating it from goals, and giving an example of valuing. Examples from the recording include “values are directions we keep moving in, whereas goals are what we want to achieve along the way” and “they are leading principles that can guide us and motivate us as we move through life.”

The audio recording was adapted from two widely used clinical tools created by ACT practitioners (Harris, 2008; Wilson & Sandoz, 2010), the Values Worksheet and the Sweet Spot exercise. As per the Values Worksheet, a focus of the recording was valuing as a dynamic, evolving process (e.g., “Values are directions we keep moving in, whereas goals are what we want to achieve along the way”). It stressed valuing as freely chosen and differing from person to person (e.g., “not everyone has the same values, and this is not a test to see whether you have the “correct” values”). The script was further tailored to those who value health by giving an example of possible health values and by including questions from the Values Worksheet and the Sweet Spot exercise that engage participants in actively thinking about what might personally motivate them to engage in healthy behaviors (e.g., “How do you want to look after your health, with regard to sleep, diet, exercise, smoking, alcohol, etc.? Why is this important?”). As per the format of *The Values Worksheet* and Stapleton et al. (2020), this recording was followed by a list of values to aid in their consideration, all specifically related to health (e.g., fitness, empowerment, accomplishment).

Participants were then given the textual prompt “What are your values related to maintaining your physical well-being? How do you want to look after your health, with

regard to sleep, diet, exercise, smoking, alcohol, etc.? Please list your own personal reasons for choosing healthy behaviors. Be specific.” A free response text box was provided. This item is consistent with the methods used in Jackson et al. (2016) and Harris (2008) and supplied an ideographic (specific to that individual) statement on values surrounding physical health for each participant.

Informational Control Condition

In order to give the control condition equivalent time spent in the study, participants randomized to the control group listened to an approximately 4-minute audio recording (see Appendix C for script). The content included statements from credible health organizations detailing recommendations for ideal dietary quality, sleep quality, physical activity, cigarette consumption, and healthy alcohol consumption levels. This health psychoeducation procedure is in line with Jackson et al. (2016)’s informational exercise statements in their control condition and will provide data on how individualized motivational statements affect health behaviors above and beyond health literacy. Time equivalence was ensured through word count compared to the intervention condition (i.e., approximately 500 words).

Daily Interventions

Starting approximately one week after completion of a battery of psychometric measures and the intervention or control recordings, values intervention participants received a morning text containing the motivational statement they constructed. Participants began the texting phase of the intervention between one and six days following the initial study timepoint. Informational control condition participants received a morning text containing instructional, actionable statements from respected

organizations on how to improve that domain of health (e.g., “Look for opportunities to reduce sedentary time and to increase active time. For example, instead of watching TV, take a walk after dinner.” – CDC;” Appendix D). These informational texts were designed to be consistent with the instructional statements seen in Jackson et al. (2016). All texts were sent through CallFire, a secure, professional texting service.

Measures

Demographics Questionnaire

A short questionnaire gathered self-report data on demographics including age, ethnicity, gender, sexual identity, and college class.

Valued Living Questionnaire (VLQ)

The VLQ assesses a participant’s values and how they are living in respect to their values across ten common life domains (e.g., family, career; Wilson et al., 2010). Participants were asked to rate how important each domain and how consistently they have acted in accordance with their values in the past week on a scale of 1 - Not at all important to 10 - Extremely important and 1 - Not at all consistent to 10 - Very consistent, respectively. Psychometric evaluation has found acceptable internal consistency ($\alpha = .67 - .79$), test-retest reliability ($r = .74 - .76$; Cotter, 2011). The VLQ shows validity through convergent and divergent correlations with related measures and through higher scores in non-clinical populations (Cotter, 2011). The measure was scored according to established procedures (Wilson et al., 2010), with higher scores indicating a greater importance in an area and greater belief one is living in line with one’s values ($\alpha = .86$ in the current sample).

A criterion for analysis required participants to rate health as a 6 or higher (on a 1 to 10 scale) on the Valued Living Questionnaire importance scale and those with a score of 5 or less were removed prior to analysis ($n = 11$). The mean physical wellbeing score of the VLQ was 8.94 with a standard deviation of 1.27 the scale uses whole integers only (i.e., only a cutoff score using whole integers is feasible). This criterion helps to ensure participants value health a priori, not due to implied researcher requirements (i.e., compliance), consistent with the ACT conceptualization of personally held values and the goal of living in alignment with these ideographic values in domains important to each participant.

Valuing Questionnaire (VQ)

The VQ (Smout et al., 2014) is a two-factor self-report measure which assesses progress in valued living and obstruction to valued living. Progress is defined as engagement with valued living, awareness of values, and perseverance, while obstruction is defined as lack of engagement with valued behaviors due to avoidance or inattention to values. Instead of using separate life domains it evaluates valued living as a whole, as many domains can overlap when valuing a specific behavior. The VQ shows good convergent and discriminatory validity and good internal reliability ($\alpha = .79 - .81$) in clinical and non-clinical samples (Smout et al., 2014). Higher scores in the two separate progress and obstruction subscales indicate higher engagement with or barriers to valued living, respectively ($\alpha = 0.80$; $\alpha = 0.81$ in the current sample).

Cigarette Consumption

Cigarette consumption contains one item taken from the National Health Interview Survey undertaken by the Centers for Disease Control and Prevention (CDC,

2016) Participants report frequency of current cigarette and e-cigarette smoking behaviors on a scale of 0 – Not at all to 2 – Every day. No Cronbach's alpha was calculated for cigarette consumption because it contains a single item.

Diet Quality Tool (DQT)

The DQT is a thirteen item self-report measure designed to assess the intake of several dietary nutrients according to the National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand's healthy eating guidelines (O'Reilly & McCann, 2012). It combines information on the number of servings of four food groups (e.g., fruit) and the quality of seven food groups (e.g., grain). Criterion and construct validity were acceptable for use, with overall DQT scores correlating with fat, fiber, and omega-3 scores ($r = -0.50$, $r = 0.55$, $r = 0.32$ respectively), though predicting only percent of energy from saturated fat ($p = .002$, $r = -0.5$). A higher score indicates eating habits more in line with nutritional guidelines ($\alpha = .77$ in the current sample). Wording of the questions and answer options have been replaced with American English where necessary to ensure comprehension by the sample (e.g., "biscuits" changed to "cookies," "takeaway meals" changed to "take out or fast food").

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was be evaluated with the PSQI (Buysse et al., 1989). Participants rate seven components of sleep quality and disturbances (e.g., duration, daytime dysfunction) in nineteen items. These seven components are subscales which are then summed for a total score. The PSQI demonstrates good internal consistency reliability ($\alpha = .70 - .80$) and good convergent and discriminant validity (Buysse, et al., 1989;

Carpenter & Andrykowski, 1998). Lower scores indicate higher sleep quality ($\alpha = .76$ in the current sample).

Quick Drinking Screen (QDS)

The QDS (Sobell et al., 2003) uses five items to assess alcohol consumption. Participants are asked to provide information in five areas: average number of days drinking per week, average drinks per week, average number of drinks when drinking, how often participants engaged in problematic drinking (i.e., more than five standard drinks), and the highest number of drinks consumed on one occasion. The QDS was originally developed to estimate these factors over the last ninety days. While no test-retest reliability is available, multiple studies have compared the QDS's performance to other problematic drinking measures (Alcohol Use Disorders Identification Test, the Time Line Follow Back Method) with favorable findings. Interclass correlations with a previously validated standard drinking measure were all significant at $p < .001$ across all domains and was additionally found to be more reliable than a second commonly used drinking measure (Letourneau et al., 2017; Sobell et al., 2003). Average number of drinks per week were calculated by multiplying average number of drinks per occasion by number of days a week on which drinking occurred, consistent with Stapleton et al. (2020)'s methodology. No Cronbach's alpha was calculated due to use of a single item.

International Physical Activity Questionnaire - Short Version (IPAQ)

The IPAQ was developed by Craig et al. (2003) to evaluate participants' physical activity. Participants rate 9 items that collect information on intensity of physical activities (slow, moderate, vigorous, and walking) and how often they were sedentary (e.g., sitting often on weekends versus only weekdays) in the past seven days. It is a

psychometrically sound measure, with good inter-method concurrent validity with the IPAQ long form ($r =$ average of .8) and acceptable reliability ($r = .35 - .88$, with $\frac{3}{4}$ of items above .65). Number of days spent in a type of activity multiplied by the number of minutes is calculated for each intensity level and the scores for each intensity level are summed. Higher scores indicate higher levels of physical activity ($\alpha = .69$ in the current sample). A Cronbach's alpha was calculated for each continuous dependent variable, with $\alpha = .70$ or higher selected a priori as evidence of acceptable internal consistency. The Cronbach's alpha for the IPAQ was less than .70 ($\alpha = .69$). Scores were retained without modification as this scale was close to the criterion for acceptability and behavioral health measures often have lower Cronbach's alphas, as exercise behaviors are not homogenous.

Generalized Self Efficacy Scale (GSES)

The GSES was developed by Schwarzer and Jerusalem (1995) to assess participants' beliefs that they can initiate and persist in goal-oriented behavior and be resourceful when unexpected difficulties arise. This ten item self-report measure asks participants to rate self-referential statements reflecting such beliefs on a four-point scale from Not at all true to Exactly true. Internal consistency of the GSES is good ($\alpha = .87 - .93$), with a unidimensional structure supported, though studies have found higher predictive validity with seven or eight rather than ten items (Bonsaksen et al., 2013; Lazić et al., 2018). It demonstrates good test-retest reliability, $ICC = .64 (.58, .70)$ and convergent validity with measures of wellbeing and positive expectations (Lazić et al., 2018). The ten items are summed, with higher scores indicating higher self-efficacy ($\alpha = .80$ in the current sample).

Assessment of Health Behavior Importance

This one item required participants to choose the domain of health most personally important to them. Options included alcohol use, nicotine use, diet quality, sleep quality, and physical activity.

Program Evaluation

A series of questions asked participants to rate aspects of the interventions to inform possible development of tools to increase health in college populations. Quantitative items include the helpfulness of the intervention regarding behavior engagement on a five-point scale (0 – 4) ranging from Not helpful to Very helpful and increased awareness of personal health valuing on a five-point scale ranging from Not at all to Very much. Qualitative items included the question “What did you like or not like about the daily text messages?” and an open text box for any other feedback.

Analytic Procedures

There were two recruitment strategies used to garner participants. The first was recruitment through undergraduate psychology classes participating in the SONA participant pool across two semesters. The second recruited students from campus through emails to official campus organizations. The samples were pooled due to similarity in demographics.

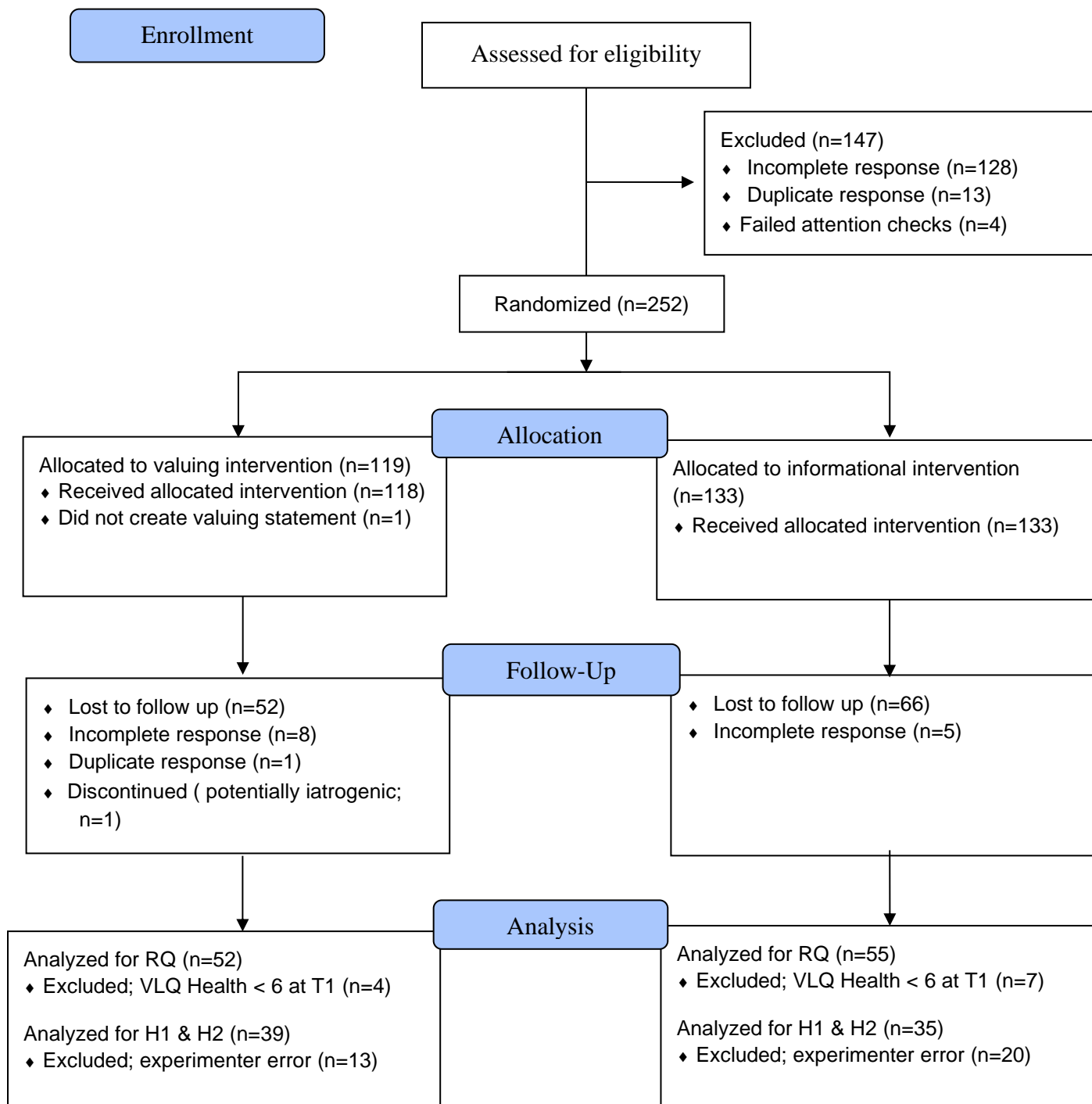
All cleaning, coding, and analyses of data was conducted using IBM SPSS version 25 using the following procedures. Duplicate observations were removed, with unique identifiers used to link potential duplicate participants ($n = 13$). Five attention check items (e.g., “select Always True if you are reading this item”) were inserted in the survey and participants who failed more than 50% of attention check items were removed

($n = 4$). The intervention was discontinued after baseline for one participant in the valuing condition after consultation with a licensed psychologist, as their valuing statement indicated the possibility of iatrogenic effects if received over text in the ecological momentary intervention. The statement indicated there may be clinical concerns around health that were outside the scope of this intervention to address.

Participants who completed the baseline survey but did not complete the second timepoint in the study were removed ($n = 118$). The overall attrition rate from baseline to post-intervention surveys was 46.8%, attrition in the valuing condition was 43.6%, and attrition in the informational condition was 49.6%. All cases with more than approximately 10% of responses missing were deleted ($n = 10$). Missing values ($n = 61$) were imputed by replacing missing values with the median of all other values for that item before scoring to mitigate possible inflated bias with skewed data or data with significant outliers. Additionally, those who indicated the importance of physical health on the VLQ as less than six on a ten-point scale were removed from all analyses ($n = 11$). Before analyses to test hypotheses 1 and 2, those who did not indicate a domain of health most personally important to them were removed ($n = 33$). These 33 participants did not complete the assessment of health behavior importance due to researcher error in constructing the online survey wherein the question was omitted. The intervention was discontinued after baseline for one participant in the valuing condition after consultation with a licensed psychologist, as their valuing statement indicated the possibility of iatrogenic effects if received over text in the ecological momentary intervention. The statement indicated there may be clinical concerns around health that were outside the scope of this intervention to address. See CONSORT Diagram (Figure 1) for details on

participant enrollment, assignment to condition, attrition at each stage of the study, and analyses.

Figure 1
CONSORT Flow Diagram



Assumptions for regression analyses were checked, and violations addressed. Several methods were used to assess normal distribution and homogeneity of variance for study variables. Graphical assessment of normality consisted of visual analysis of Q-Q plots, with normality inferred by expected normal and actual observed values represented approximately on the same line and abnormal distribution indicated by curvilinear patterns. Distribution was additionally assessed using a Shapiro-Wilk's test, with $p > .05$ indicating normality. Tests for skewness and kurtosis and their standard errors were produced in SPSS, with values within ± 1.0 indicating normal distribution.

Three multivariate outliers for the Research Question were identified via Mahalanobis distance. Given power concerns these cases were retained as the planned analyses were robust to a small number of outliers. Additionally, such outliers are common in health and risk behaviors (Boulton & Williford, 2018; Neal & Simmons, 2007), and these values were relevant to the study in showing the unique health status of participants. For hypotheses testing, univariate outliers were screened via z scores with values that exceed the critical value ($z \pm 3.29$) addressed with a 90% winsorization.

The IPAQ was non-normally distributed ($W(252) = .860, p < .001$), with a skewness of 1.56 ($SE = .153$) and kurtosis of 3.321 ($SE = .306$), indicating the majority of participants did not have high physical activity levels. Z-scores were used to eliminate outliers that exceeded the critical value indicated above. The DQT was also abnormally distributed ($W(252) = .860, p < .001$), as were the VQ Values progress subscale ($W(252) = .964, p < .001$) and the GSE ($W(252) = .978, p < .001$). No scores were removed for these measures because outliers did not fall outside of the critical value. The nicotine

consumption item was non-normally distributed ($W(252) = .581, p < .001$), and was right-skewed at 1.36 ($SE = .153$), indicating low nicotine use in this sample. The PSQI was non-normal ($W(252) = .969, p < .001$), and outliers that exceeded the critical value were removed. Additionally, the QDS item indicated a non-normal distribution ($W(252) = .722, p < .001$) and right skewness (1.190). The distributions of study variables were not an extreme departure from normality and were in line with distributions expected for health behaviors. Thus, data were not transformed in order to retain important information on health behavior challenges in the sample.

Power Analyses.

Power analyses were conducted for each primary analysis using G*Power 3.1. All analyses were conducted using a significance value of .05 and a power of .80. A sample size of 112 was needed to power the ANCOVAs required by Research Question one, which used two groups and one covariate each. The obtained sample of 107 was underpowered to detect a medium effect size for Research Question One. Participants whose data did not indicate a most personally important domain of health due to researcher error were removed ($n = 36$) before analyses to test H1 and H2. A sample size of 112 was needed to adequately power the ANCOVAs required to test hypothesis one, which used two groups and one covariate. The obtained sample of 72 participants for H1 was underpowered to detect the anticipated medium effect size. A sample size of 119 was needed to test hypothesis two, given three tested predictors in a linear multiple regression model, to approximate a calculation for mediation. The mediation analysis for H2 was underpowered with a sample size of 72.

Results

Descriptive Statistics

Descriptive statistics and bivariate correlation matrices using Pearson's correlation coefficient were calculated for all study variables at baseline (Table 2). These showed that greater values progress was associated with higher general self-efficacy and better sleep quality. Additionally, more nicotine use was associated with more alcohol consumption.

Table 2
Correlations between Study Variables at Baseline

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------|------|--------|-------|-------|--------|---------|--------|
| 1. Values Progress | - | .172 | .056 | -.024 | .094 | -.296** | .510** |
| 2. Physical Activity | | - | -.080 | .189 | -.044 | -.108 | .005 |
| 3. Nicotine | | | - | -.129 | .264** | .105 | .113 |
| 4. Diet | | | | - | -.050 | .058 | -.061 |
| 5. Alcohol | | | | | - | .058 | .048 |
| 6. Sleep | | | | | | - | -.147 |
| 7. Self-Efficacy | | | | | | | - |
| M | 20.1 | 657.3 | 0.4 | 40.0 | 3.4 | 6.7 | 17.7 |
| SD | 4.9 | 1232.2 | 0.7 | 18.1 | 7.3 | 3.1 | 3.4 |

Note: * $p < 0.05$; N = 107

A series of t-tests were conducted to explore baseline differences in study variables between values intervention condition and the informational control condition (Table 3). There were no significant differences between conditions across core health outcomes. There was a significant difference in values progress ($t(105) = 2.58, p = .011$) such that participants randomly assigned to the value intervention condition ($M = 21.4, SD = 4.7$) were already showing more action in line with personal values and perseverance in those actions relative to the control condition ($M = 19.00, SD = 5.00$); Table 3.

Baseline correlations were then calculated for relationships between dichotomous baseline variables (gender, ethnicity, sexual orientation, and age) and continuous baseline variables. Higher age correlated with higher diet quality ($r = .27, p < .01$). A heterosexual identity was associated with lower self-efficacy ($r = -0.26, p < .01$) and poorer sleep quality ($r = .24, p < .05$). A 2 x 4 Fisher's exact test (alcohol use omitted because no participants selected it) was used to explore frequencies of selected health domain by experimental condition (Table 4). There was no statistically significant difference in domains ($p = .392$).

Table 3*Baseline Scores and Comparisons Between Intervention Conditions*

| Measure | Valuing (n = 52) | | Information (n = 55) | | Comparison | | |
|-------------------|---------------------|-------|-------------------------|--------|------------|------|-------|
| | M | SD | M | SD | t | p | d |
| Values Progress | 21.4 | 4.7 | 19.0 | 5.0 | 2.58 | .011 | 0.49 |
| Physical Activity | 672.4 | 967.7 | 643.1 | 1447.7 | 0.12 | .903 | 0.02 |
| Nicotine | 0.4 | 0.8 | 0.4 | 0.7 | 0.42 | .679 | 0.0 |
| Diet | 38.6 | 17.8 | 41.3 | 18.4 | -0.77 | .411 | -0.15 |
| Alcohol | 3.4 | 6.3 | 3.4 | 8.1 | -0.00 | .999 | 0.0 |
| Sleep | 6.2 | 3.2 | 7.3 | 3.4 | -1.73 | .086 | -0.33 |
| Self-Efficacy | 18.1 | 3.5 | 17.3 | 3.3 | 1.23 | .223 | 0.24 |

N = 10

Table 4*Frequencies for Selected Health Domains of Most Personal Importance by Condition*

| Domain | Valuing | Informational | N(%) |
|-------------------|---------|---------------|----------|
| Physical Activity | 14 | 13 | 27(36.5) |
| Nicotine | 1 | 0 | 1(1.4) |
| Diet | 5 | 11 | 16(21.6) |
| Alcohol | 0 | 0 | 0(0) |
| Sleep | 15 | 15 | 30(40.5) |
| Total | 35 | 39 | 74(100) |

N = 74

Hypothesis 1

The intervention condition was hypothesized to show greater standardized improvements in selected health outcome of most personal importance relative to pre-post changes in the control condition. This hypothesis was tested using an analysis of covariance (ANCOVA). The independent variable entered into the model was intervention condition. The dependent variable was a standardized (expressed as z-scores) pre-post intervention change score in the participant selected health domain. Change scores were calculated such that positive scores reflected a positive change in health. For example, change scores for the IPAQ, in which higher scores indicate healthy behavior, were calculated by subtracting pre-test from post-test scores. Change scores for measures in which high scores indicate unhealthy behavior, such as the QDS and PSQI, were calculated by subtracting post-test from pre-test scores. The standardized baseline score for the relevant health domain was entered for each participant as a covariate. There was no significant effect of intervention condition on health behavior change in participant selected domain after controlling for baseline scores in participant selected domain, $F(1, 73) = 0.40, p = .531, \eta_p^2 = .006$. The mean of the valuing condition was -0.00 (SD = 0.72) and the mean of the informational control condition was .11 (SD = .72).

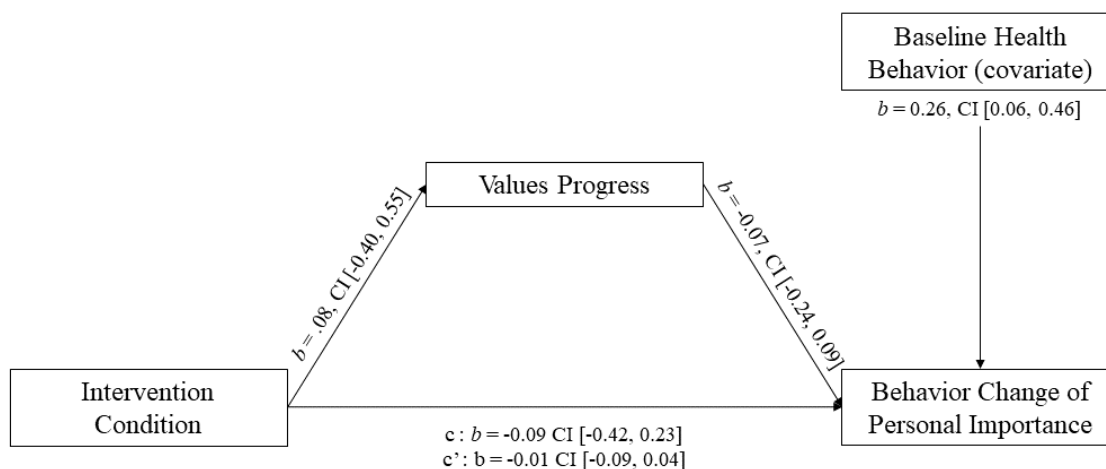
Hypothesis 2

Changes in values awareness and engagement were hypothesized to mediate the relation between condition and the change score in selected health outcome of most personal importance, with participants in the intervention condition experiencing improvements in their chosen domain via the indirect effect of the valuing process. This hypothesis was tested using the SPSS PROCESS macro model 4. Intervention condition

(Values intervention condition = 1) was entered as the predictor, the standardized pre-post intervention change score in the participant selected health domain was entered as the dependent variable for both groups, and a pre-post-intervention change score for values progress from the VQ was entered as the mediator. The standardized baseline score for that health domain was entered as a covariate. Results showed that intervention condition was not associated with a change in values progress ($b = 0.08$, $se = 0.24$, $t = 0.32$, $p = .749$; Figure 2). Values progress was not associated with a change in health behavior in the domain of most personal importance ($b = -0.07$, $se = 0.08$, $t = -0.93$, $p = .351$). A bootstrap estimation approach was used to compute standardized indirect effects for each of 10,000 bootstrapped samples, with 95% accelerated confidence intervals used to determine significant paths. The indirect effect was not significant, (95% $CI [-0.09, 0.04]$), indicating a lack of mediation by a change in values progress.

Figure 2

Mediation Results for Hypothesis 2



Research Question

The impact of the values intervention and control intervention across the health domains (i.e., physical activity, dietary quality, sleep quality, alcohol use, and cigarette consumption) was explored to determine if the values intervention led to greater general improvements in health domains. This research question was tested using a series of six ANCOVAs. The independent variable was intervention group and dependent variables included physical activity, dietary quality, sleep quality, alcohol consumption, cigarette consumption, and overall health at post-intervention (T2). For all analyses, the covariates were baseline scores for the corresponding health domain. For example, when the domain of most personal importance was the dependent variable, the IPAQ score served as the covariate. The effect of intervention condition on health behavior change while controlling for baseline score was not significant for all dependent variables. See Table 5 for ANCOVA results. See Table 6 for means and standard deviations by condition.

Table 5
Between Group Analysis of Baseline Changes in All Health Domains

| | F | p | η_p^2 |
|-------------------|--------|--------|------------|
| Physical Activity | | | |
| Baseline | 260.15 | <.002* | .714 |
| Condition | 3.68 | .058 | .034 |
| Nicotine Use | | | |
| Baseline | 6.66 | .011* | .060 |
| Condition | .006 | .936 | .000 |
| Diet | | | |
| Baseline | 4.79 | .031* | .044 |
| Condition | 0.92 | .340 | .009 |
| Alcohol Use | | | |
| Baseline | 98.25 | <.002* | .486 |
| Condition | 0.11 | .746 | .001 |
| Sleep Quality | | | |
| Baseline | 67.39 | <.002* | .393 |
| Condition | 0.49 | .484 | .005 |

*p < 0.05; Baseline = baseline value of construct entered as a covariate

Table 6
Pre- and Post-test Descriptive Statistics for Research Question Variables by Condition

| | Valuing (n = 52) | | Informational (n = 55) | | d |
|--------------------------|---------------------|-------|---------------------------|--------|-------|
| | M | SD | M | SD | |
| Physical Activity | | | | | |
| Baseline | 672.4 | 967.7 | 643.1 | 1447.7 | 0.02 |
| Post-test | 626.0 | 843.8 | 420.6 | 432.0 | 0.31 |
| Nicotine | | | | | |
| Baseline | 0.4 | 0.8 | 0.4 | 0.7 | 0.00 |
| Post-test | 0.4 | 0.7 | 0.4 | 0.8 | 0.00 |
| Diet | | | | | |
| Baseline | 38.6 | 17.8 | 41.3 | 18.4 | -0.15 |
| Post-test | 40.0 | 19.1 | 40.6 | 18.3 | -0.03 |
| Alcohol | | | | | |
| Baseline | 3.4 | 6.3 | 3.4 | 8.1 | 0.00 |
| Post-test | 3.2 | 6.2 | 2.8 | 5.2 | 0.07 |
| Sleep | | | | | |
| Baseline | 6.2 | 3.2 | 7.3 | 3.4 | -0.33 |
| Post-test | 4.5 | 2.3 | 5.3 | 2.3 | -0.35 |

N = 107

Program Evaluation

Participants rated the helpfulness of the intervention a mean score of 3.66 (SD = 0.92) on a 5-point scale. Those in the intervention had a mean score of 3.7 (SD = 0.9) and those in the informational condition had a mean score of 3.6 (SD = 1.0). Participants evaluation of an increase in values awareness from the intervention on a 5-point scale had a mean of 3.33 (SD = 0.97). Those in the intervention had a mean score of 3.6 (SD = 1.0)

and those in the informational condition had a mean score of 3.2 (SD = 0.9). These items asked participants for their opinion on the daily texts and on the interventions as a whole. Questions included “What did you like and not like about the daily texts” and “Please give any other feedback you chose or type n/a.” Statements were categorized by theme as per the qualitative content analysis method (Bengtsson, 2016). See Table 7 for frequencies in all categories.

Table 7
Program Evaluation Dimension Frequencies

| | Total | Valuing | Informational |
|------------------------|-------|---------|---------------|
| Good reminder | 19 | 15 | 4 |
| Motivating | 16 | 6 | 10 |
| Uncategorized | 13 | 5 | 8 |
| Good information | 10 | - | 10 |
| Good, general | 12 | 6 | 6 |
| Not applicable to me | 8 | - | 8 |
| Helped with my goals | 8 | 8 | - |
| Felt personalized | 10 | 9 | 1 |
| Bad, general | 6 | 2 | 4 |
| Thought provoking | 5 | 4 | 1 |
| Timing of texts | 6 | 2 | 4 |
| Ambivalent | 6 | 5 | 1 |
| Helped valued behavior | 5 | 5 | - |
| Actionable | 2 | - | 2 |
| Unhealthy reminder | 2 | - | 2 |
| Future suggestions | 2 | - | 2 |

N = 9

Discussion

An ACT-congruent valuing intervention to increase health behaviors in college students was compared to a traditional informational intervention. Previous research demonstrated that informational interventions have no or small effects on long-term health behavior change, whereas newer research points to values-based and personalized interventions having positive effects on behavior change. This study found a positive association between progress toward living in line with one's values and the belief that one can act effectively. It was also found that higher levels of unhealthy behavior, such as nicotine and alcohol use are associated with poorer health habits and outcomes, as is consistent with the literature. However, those given the valuing intervention did not show greater positive health behaviors in domains of most personal importance than those given the informational intervention, in contrast with the findings of Jackson et al. (2016). Nor did changes in values progress mediate the relation between intervention condition and changes in health domains of most personal importance. Additionally, neither intervention led to more significant differences in behavior change when compared in analyses to test the exploratory research question.

Although values-specific studies related to physical health are relatively novel, there is support for the relationship between valuing and positive health outcomes in the literature (Lillis et al., 2021; Gregg et al., 2014). Additionally, literature shows that text-delivered interventions are effective for improvement in psychological and physical health outcomes (Berrouiguet et al., 2016; Mason et al., 2015). Therefore, it would be

inappropriate to interpret the obtained null findings as evidence that valuing interventions are never useful in affecting health behavior change.

One conclusion that may be drawn from this study's findings is that the valuing intervention needs improvement. There is support for this interpretation in the past effectiveness of ACT and values-based interventions on physical health, in quantitative and qualitative program analysis data, and in literature on technological intervention design. Non-significant results are vital to explore in the progression of science; they tell us where to improve and where to move forward. Pilot studies are a necessary step in intervention development and can be said to function as not an end point but a step in the design process (Lerner et al., 2000).

Both quantitative and qualitative program evaluation data indicate that there are favorable elements in the study design, with quantitative ratings showing moderate social validity (see Tables 8 and 9). Qualitative feedback also provided valuable information on the acceptability and useability of interventions. Results indicated that varying participants found the interventions motivating, good reminders of their goals and values, personalized, to contain valuable information, and generally positive. For example, one participant stated, "the one thing I liked most about the daily messages was the positive motivation it gave me to go throughout the day." Another participant stated, "I liked that it made me actually think about why I do the things I do in my life." However, there were comments that the interventions were not personally applicable (only in the informational condition), not useful, or that texts should have been sent at a different time of day. Examples of such comments are "I don't have health problems," and "... For me, walking is a kind of activity that takes a lot of motivation because of the amount of pain

I'm in. I know disabled people are not the majority, but it might be something to think about." Some comments were classified as "uncategorized" and include statements such as "the survey was too long." The total of negative or ambivalent comments in the informational condition was 15, as compared to seven in the valuing condition.

Several participants in the valuing condition stated that the daily texts helped them to engage in valued behavior. However, although the valuing intervention received more positive feedback from participants, less of those assigned to this condition indicated that it was motivating. This is problematic given that values as conceptualized in ACT serve as motivational augments (Kissi et al., 2017; Smout et al., 2014; Zettle & Hayes, 1982). Given the number of participants whose statements contained behavioral goals rather than values, this stands as evidence that the front-end intervention requires more depth and weight. An example of goal-oriented statement content includes "I would like to get back to going to bed at 10 and getting up at 8 everyday to get back on a sleep schedule." A contrasting example of values-oriented content include "I want to be able to challenge myself on a regular basis." The brevity of intervention this study used as a strategy to retain participants' engagement with the recordings should be balanced with consideration of an ideal dosage. Future interventions might be designed to delineate the difference between values and goals in a more in-depth manner, possibly with multiple exemplars rather than one exemplar (Krafft et al., 2017; Rahal & Gon, 2020). Further, more expansive experiential exercises could be included, or the current exercise modified, so that participants have a longer period of time in which to interact with the content and receive benefits (Huiyuan et al., 2021).

Additionally, construction of values usually occurs in clinical settings which allow for significant time and personal, one-on-one feedback. This intervention was based on clinical tools typically used in an in-person setting with a licensed professional, wherein the client has access to this feedback and ongoing construction of values through discussion. This process is supported in ACT-based interventions on health that utilize one or more sessions of one to five hours of values work to encourage health outcomes (Lillis et al, 2021) and self-guided digital interventions for health that provide multiple modules (Firestone et al., 2019). Inclusion of telehealth or other one-on-one initial interventions may help individuals requiring assistance in detecting appetitives, discriminating the behavior they need to contact, tacting appropriate contingencies, or shifting perspective between time and place if their learning histories have not provided opportunities to develop these skills (Hayes et al., 2013).

Another factor to consider specifically in valuing studies is that of motivation. When in the presence of another motivator, valuing rules presented should be as or more motivating than it to increase values-based behavior (Fryling 2012; Ju & Hayes, 2008; Wheelan & Barnes-Holmes, 2004). Yet the primary motivation, rather than a co-motivator, of participants to complete the study was possibly psychology class credits. If students received the required number of research participation credit before completing the second timepoint, this may have additionally encouraged attrition. For example, one program evaluation comment stated, “reminded me to do the study.” Motivation to complete psychology studies may compete with the motivating augmental we tried to make salient rather than having an additive effect. This is not necessarily detrimental; academic success is a useful and workable goal for students. Other strategies for

participant recruitment could mitigate this problem in the future by drawing from college students who express an interest in improving their health for its own sake. Alternatively, having a competing establishing operation may mimic real world contexts in which people can a variety of motivations for many actions. Such situations include university and corporate insurance programs which require members to attend the gym a certain number of times per semester to lower their insurance premiums. This is an important reminder that all behavior occurs in context which cannot always be controlled for in intervention design, meaning that no online, self-guided, or mobile phone app intervention will work for every member of the target population. One solution for this complexity would be to draw on the student population when designing and modifying interventions.

Limitations and Future Directions

One limitation of this study is that scale reliability of one measure fell slightly below the acceptable level of .70. The IPAQ ($\alpha = .69$) was included in this study as a replication of Stapleton et al. (2020)'s domains of health, in which a Cronbach's alpha was not reported. However, the IPAQ is usually administered in professional settings where individual elements are discussed, and clinical recommendations made. This measure is not best assessed using classic test theory, as the items reflect different dimensions of behavior (i.e., intensity, frequency) rather than representing one latent construct (DeVellis, 2006; Tavakol & Dennick, 2011). The reliability of the IPAQ could also be associated with variables outside the scope of this study, for example the comment one participant gave on their physical disability which directly referenced the IPAQ ("... For me, walking is a kind of activity that takes a lot of motivation because of

the amount of pain I'm in. I know disabled people are not the majority, but it might be something to think about”).

This sample was representative of most university populations in the United States as it was primarily White women under the age of 24 (U.S. Department of Education, 2017) and could be considered generalizable to many students. However, future studies should include more diverse samples to ensure that their interventions can be useful to gender, sexual, and ethnic minoritized individuals and to universities with differing majority characteristics. For example, a heterosexual identity was correlated to poorer sleep quality in this study, which is contrary to past findings (Patterson & Potter, 2019). Inclusive samples can shed light on inconsistent findings as well as intervention efficacy in these populations.

Another consideration in interpreting results is underpowered statistical analysis. Although some literature suggests that the sample size obtained is adequate, most guidelines for obtaining sufficient power indicates the need for more participants in intervention trials (Bujang et al., 2017; Shieh, 2020). Support for null hypotheses in this study may be the result of an underpowered analysis and a larger sample could show significant results. This study's difficulties with sampling are shown through attrition (46.8%) between pre- and post-intervention timepoints, a common difficulty in related study designs such as randomized controlled trials (Eysenbach, 2005; Meyerowitz-Katz et al., 2020; Siger & Bossarte, 2006). Literature suggests that technologically delivered, large-scale trials addressing physical and behavioral (e.g., alcohol use) health have rates of attrition between 32 and 43% (Edney et al., 2019; Meyerowitz-Katz et al., 2020; Postel et al., 2011). Researcher error in constructing the baseline survey also contributed to low

power in this study. In the future, researchers may consider obtaining integrity checks from colleagues. Once future studies obtain enough power to show potential significant effects, effect sizes should be examined to interpret results. If the primary aim of health interventions is to improve lives in a way that is appreciable for the target population, clinical significance of resulting behavior change should be considered. While statistical significance can reveal whether an effect is likely, effect sizes can demonstrate the practical significance of results (Harris et al., 2017; Ranganathan et al., 2015). The difference between baseline variables in this study had a range of effect sizes, from none to medium. Effect sizes across health domains should be compared to give information on the effectiveness of interventions for varying health outcomes and inform design. This would also allow future researchers to calculate sample sizes needed to obtain significant results and for inclusion of multiple studies in meta-analyses (Cohen, 1962; Tomczak & Tomczak, 2014

A change recruitment strategy may assist in garnering more participants and in selecting participants who are less likely to attrit. In this study two recruitment methods were used and drawing from the overall university population rather than psychology classes did not significantly increase the number of participants. Timing of sampling during academic semesters could also be explored as a factor in attrition. An alternative method for recruitment in future digital health intervention studies may be drawing from a population who are already seeking health behavior change, as mentioned above. This would be consistent with the ACT conceptualization of valuing, as participants would value health a priori rather than engage with the intervention due to pressure to comply with researcher-selected procedures and related behaviors. Students already invested in

seeking ways to change their health-related behaviors would be less likely to attrit and may find the valued behaviors themselves compensation for participation. This would increase the power of analyses and allow for more sound interpretation of study results. Such samples of college students could be drawn from previously established campus services.

For example, Jackson et al. (2016) recruited participants who were enrolled in a cycling class at their university. Also, most universities have medical services on campus for student use. Providers could be contacted and asked to refer appropriate students to the study to allow them the possible benefits of intervention engagement alongside recommended medical advice. Another source of sampling could be the free counseling and therapy services commonly offered on university campuses. Therapists and counselors could be contacted to refer suitable clients expressing health concerns. All professional sources of recruitment would be provided with evidence from the literature supporting the use of digital health interventions and ACT-based interventions and plans for ensuring the privacy of their patients. This recruitment method has the benefit of exploring ways to amplify the benefits of treatment as usual.

Synthesis of the technologically delivered interventions and traditional treatments in future research could address the aforementioned possible difficulties in constructing values in a non-clinical setting. Daily ecological momentary interventions (EMIs) through text should be explored as an adjunct to campus therapy and medical centers, a method proven useful in clinical disorders (Clough & Casey, 2011; Heron & Smyth, 2010; Newman et al., 2015). This usage would attenuate front-end difficulties through inclusion of immediate feedback on values construction in therapy centers. Many

doctor's offices and hospitals are now offering Focused Acceptance Commitment Therapy (FACT; Glover et al., 2016; Kanzler et al., 2022), in which providers are trained to provide one session ACT interventions focused on changing health behavior through the valuing process, and these and similar service would mitigate these difficulties. This approach could additionally reduce the burden on these facilities and offer support to clients daily instead of bimonthly or until their next appointment. Practitioners would also be qualified to determine a client or patient's state of change, as the states of change model purports that contemplation of and preparation for change are necessary for the relevant behaviors to occur (Prochaska & DiClemente, 1983).

There is evidence that technological interventions spanning 10-14 days can lead to positive outcomes (Criddle et al., 2021; Jackson et al., 2016; Jeffers et al., 2019; Lazev et al., 2004; Nam et al., 2019; Wietzel et al., 2015) and the current study used a 10-day window of EMI delivery to reduce participant burden. Additionally, ten days is sufficient for an exploratory analogue study for brief behavior change to inform future research that may develop longer-term interventions for health behavior change. There are multiple cases in which even one session of ACT or motivational interviewing and Focused ACT (FACT) have been shown to produce favorable results (Baretto & Gaynor, 2019; Berman et al., 2010; Dochat et al., 2021; Ruiz et al., 2020). There is also literature on other brief therapy treatments providing positive changes for clients (Draper et al., 2002). However, psychotherapy treatment consists of an average of 8.7 sessions (Flückige et al., 2020). Despite much early discontinuation of medical and behavioral health services (Miller & Brennan, 2015; NORC, 2018; Reljic et al., 2019; Ti & Ti, 2015), medical treatment can last between days and a lifetime depending on the health concern. Given the average

length of professional sessions to address behavior change and treatment discontinuation rates, increasing the duration of EMI delivery may prove effective. A dosage increase would provide additional support for students between professional appointments throughout the course of treatment and could be used by individuals after termination of services to increase the longevity of treatment benefits. However, the dropout rate for in-person services is high, indicating the need for interventions that extend past initial treatment periods (Linardon et al., 2019; Swift & Greenberg, 2012).

Another way to increase EMI dosage would be a change in content rather than a change in frequency or duration. Many ACT-based self-help programs and mobile phone applications used without professional services are effective (Bricker et al., 2014; Potts et al., 2020). Another alternative to increasing the duration of EMI delivery or length of front-end interventions is the use of interactive content. Studies show that micro-engagement with technologically delivered content increases the effectiveness of interventions (Voorheis et al., 2022).

Both quantitative and qualitative program evaluation data can be useful when designing future interventions. They can indicate what elements to modify, to discontinue, or to continue implementing. For example, participants in this study commented that they enjoyed the medium of text for daily EMIs, indicating that future research should continue to explore this delivery method. Two students also had positive comments about nightly EMAs delivered tangential to this study, stating they helped them stay focused on content throughout the day and in reflection on the resulting data of their own behaviors. Texting has the benefit of allowing for high frequency, low intensity interventions. Texting is also accessible, cost-effective, and easy to implement as

compared to in-person services (Gaziano et al., 2015; Paganini et al., 2019). Mobile phone prompts for self-guided interventions or fitness and diet tracking applications could also provide a means to increase engagement with content.

Recent research has indicated other methods to increase the success of mobile health interventions. The integration of behavioral design and design theory allows for interventions to incorporate behavior change strategies with efficient delivery methods and user experience considerations (Voorheis et al., 2022). A bottom-up method of co-creating intervention content and delivery could help ensure engagement and satisfaction of participants (Arevian et al., 2018; Cyril et al., 2015; Wright et al., 2016). Researcher-population collaborations can also ensure that participant and user needs are being met; the target community will have valuable input about their needs, values, and preferences that researchers may not be able to anticipate and inclusion of which will ensure more effective and ecologically valid interventions (Lerner et al., 2000). One might say that this is the primary purpose of all research in the social sciences, rather than research for its own sake (Kurtines et al., 1990; Lerner et al., 2000). Methods for co-creation could include focus groups of students for varying aspects of intervention content and delivery and expansive program evaluations to inform future iterations of projects.

Congruence of study design and analysis with theoretical frameworks used to create interventions should also be considered in future research. Although this study included personalized elements for participants in the intervention (i.e., valuing statement), only one such element was incorporated into the study design and analysis (i.e., the participant selected behavior domain of most personal importance). There are multiple methods which can achieve this aim, such as utilizing single subject design,

longitudinal data collection, network analysis, and the inclusion of processes of change variables in studies. Use of these methods would additionally allow for more cross-disciplinary comparison of findings, such as single subject design in exercise science research.

While general comparative group trials are useful to test the effectiveness of developed products, initial development of interventions would greatly benefit from a combination of nomothetic and ideographic approaches. This could address the issue of individual responding patterns in group research violating the ergodic assumptions underlying common analytic methods (Lowie & Verspoor, 2019; Molenaar, 2007; Sanford et al., 2022). Larger group trials focus on specific behaviors, yet behaviors hold different functions for different individuals and inferences about populations do not generalize to all individuals (Staines, 2008). Specifically, valuing is an ideographic process in which valued behaviors will differ in topography and function across participants. Given that all behavior occurs in context, which changes from moment to moment as well as varying by subject, the control offered by single subject designs (SSD) can ensure that the effects of a treatment are due to the administration of the treatment rather than unaccounted for factors and that it produces effects repeatedly (Holman & Koerner, 2014). Utilizing SSD to explore valuing interventions can reduce resulting intersubject variability due to contextual and personal factors, as each participant serves as their own control group (Barlow & Hayes, 1979). SSD can also offer vital information on minimum effective treatment dosages which are high enough to produce results yet low enough to encourage participant engagement, a concern in the current study. These design methods would additionally reduce the number of participants needed for analysis,

allowing for reliable results despite constraints such as funding concerns or attrition common in larger trials (Consolidated Standards in Reporting Trials, 2010; Shore et al., 2012).

Starting valuing intervention development at the single subject level allows for comparison of response patterns across multiple participants where individual context and characteristics can inform decisions on how, why, and for whom interventions are successful, leading to further development based in common factors with more precision than traditional mediation and moderation analyses (Hayes et al., 2018). The additional inclusion of process of change variables at the individual or group level can allow researchers to determine what biopsychosocial processes may maintain or change health related behaviors over the course of intervention (Hayes et al., 2018). Interventions can then be modified to enhance or omit elements that target specific mechanisms that are or are not driving behavior change.

Results from single subject designs and utilization of change process measures applied to the refinement of interventions may then provide a more evidence-based program to be tested at the group level. Group level studies would then provide opportunities for statistical methods such as network analysis and Group Iterative Multiple Model Estimation which can be used to combine idionomic and nomothetic approaches (Hoffman et al., 2021). These analytic strategies allow for the construction of temporal models providing insight into the directionality and multidirectionality of processes of change and into time fluctuating relationships between variables to best design interventions (Hasselmann & Bosman, 2020; Jordan et al., 2020; Sanford et al., 2022).

Additionally, future studies on health behavior change may also consider the limitations of self-report. Some of these include recall bias, social desirability responding, and the subjective nature of responses concerning observable behavior (Gmel & Daeppen, 2007; Sallis & Saelens, 2000; Steene-Johannessen et al., 2017; van de Mortel, 2008). The use of EMAs for self-report can mitigate concerns about recall when participants are asked to report recent or current events and increase the ecological validity of studies (Smith & Juarascio, 2019). If possible, the production of a permanent product of behavior is an ideal strategy to assess behavior change as it provides accurate, objective data to analyze and from which to draw more conclusions. This could be accomplished with technologies such as fitness tracker watches and mobile phone applications, which record a variety of data related to health such as steps taken, heart rate, and sleep quality (Chow & Yang, 2020; de Zambotti et al., 2016; Stackpool, 2013).

Conclusion

In summary, there is a dearth of research exploring valuing interventions for health behavior change, especially in the college population. This study attempted to compare a valuing intervention to a traditional informational intervention in the attempt to affect such change. From the non-significant results, it can be concluded that the design of such interventions should incorporate student feedback and co-development and design theory with traditional development approaches to best tailor interventions to this population. Technologically delivered health behavior change interventions can be explored as an adjunct to therapy to enhance the effectiveness of both therapeutic treatments and EMIs. Further, study methods should include research design, measures,

data collection strategies, and analytic methods which reflect the ideographic nature of the valuing process in affecting personal change.

References

- Adams, J., & White, M. (2004). Why don't stage-based activity promotion interventions work? *Health Education Research*, 20(2), 237-243. <https://doi.org/10.1093/her/cyg105>
- Adams, S. K., Williford, D. N., Vaccaro, A., Kisler, T. S., Francis, A., & Newman, B. (2016). The young and the restless: Socializing trumps sleep, fear of missing out, and technological distractions in first-year college students. *International Journal of Adolescence and Youth*, 22(3), 337-348. <https://doi.org/10.1080/02673843.2016.1181557>
- Agency for Healthcare Research and Quality. (2011). *Health literacy interventions and outcomes: An update of the literacy and health outcomes systematic review of the literature* (11-E006).
- American College Health Association (ACHA; 2021). *ACHA-NCHA III Undergraduate Student Reference Group Executive Summary*. https://www.acha.org/documents/ncha/NCHA-III_SPRING-2021_UNDERGRADUATE_REFERENCE_GROUP_EXECUTIVE_SUMMARY_updated.pdf
- Arevian, A. C., O'Hora, J., Jones, F., Mango, J., Jones, L., Williams, P., Booker-Vaughns, J., Jones, A., Pulido, E., Banner-Jackson, D., & Wells, K. B. (2018). Participatory technology development to enhance community resilience. *Ethnicity & Disease*, 28(Supp), 493-502. <https://doi.org/10.18865/ed.28.s2.493>

Association of American Colleges & Universities. (2021, April 28). *The health of our students: What do we know?* <https://www.aacu.org/publications-research/periodicals/health-our-students-what-do-we-know>

Association for Contextual Behavioral Science (2022, May). *ACT randomized controlled trials since 1986.*

https://contextualscience.org/act_randomized_controlled_trials_since_1986

A-Tjak, J. G., Davis, M. L., Morina, N., Powers, M. B., Smits, J. A., & Emmelkamp, P.

M. (2014). A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems.

Psychotherapy and Psychosomatics, 84(1), 30-36.

<https://doi.org/10.1159/000365764>

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215. <https://doi.org/10.1037/0033-295x.84.2.191>

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American*

Psychologist, 37(2), 122-147. <https://doi.org/10.1037/0003-066x.37.2.122>

Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing the effects of two treatments in a single subject. *Journal of Applied*

Behavior Analysis, 12(2), 199-210. <https://doi.org/10.1901/jaba.1979.12-199>

Berrouiguet, S., Baca-García, E., Brandt, S., Walter, M., & Courtet, P. (2016).

Fundamentals for future mobile-health (mHealth): A systematic review of mobile

- phone and web-based text messaging in mental health. *Journal of Medical Internet Research*, 18(6), e135. <https://doi.org/10.2196/jmir.5066>
- Barnes-Holmes, D., Barnes-Holmes, Y., Power, P., Hayde, E., Milne, R., & Stewart, I. (2006). Do you really know what you believe? Developing the Implicit Relational Assessment Procedure (IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist*, 32, 169–177.
- Barnes-Holmes, Y., Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2002). Relational frame theory: A post-skinnerian account of human language and cognition. *Advances in Child Development and Behavior*, 101-138. [https://doi.org/10.1016/s0065-2407\(02\)80063-5](https://doi.org/10.1016/s0065-2407(02)80063-5)
- Barrett, K., O'Connor, M., & McHugh, L. (2019). A systematic review of values-based psychometric tools within acceptance and commitment therapy (ACT). *The Psychological Record*, 69(4), 457-485. <https://doi.org/10.1007/s40732-019-00352-7>
- Bartsch, R. A., Case, K. A., & Meerman, H. (2012). Increasing academic self-efficacy in statistics with a live vicarious experience presentation. *Teaching of Psychology*, 39(2), 133-136. <https://doi.org/10.1177/0098628312437699>
- Becker, S. P., Jarrett, M. A., Luebke, A. M., Garner, A. A., Burns, G. L., & Kofler, M. J. (2018). Sleep in a large, multi-university sample of college students: Sleep problem prevalence, sex differences, and mental health correlates. *Sleep Health*, 4(2), 174-181. <https://doi.org/10.1016/j.sleh.2018.01.001>
- Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open*, 2, 8-14. <https://doi.org/10.1016/j.npls.2016.01.001>

- Berghoff, C. R., Ritzert, T. R., & Forsyth, J. P. (2018). Value-guided action: Within-day and lagged relations of experiential avoidance, mindful awareness, and cognitive fusion in a non-clinical sample. *Journal of Contextual Behavioral Science, 10*, 19-23. <https://doi.org/10.1016/j.jcbs.2018.07.005>
- Berman, A. H., Forsberg, L., Durbeej, N., Källmén, H., & Hermansson, U. (2010). Single-session motivational interviewing for drug detoxification inpatients: Effects on self-efficacy, stages of change and substance use. *Substance Use & Misuse, 45*(3), 384-402. <https://doi.org/10.3109/10826080903452488>
- Biglan, A. (1987). A behavior-analytic critique of Bandura's self-efficacy theory. *The Behavior Analyst, 10*(1), 1-15. <https://doi.org/10.1007/bf03392402>
- Bond, F. W. (2004). Acceptance and commitment therapy for stress. In S. C. Hayes & K. D. Strosahl (Eds.), *A Practical Guide to Acceptance and Commitment Therapy* (pp. 275-293). Springer-Verlag, New York.
- Bonsaksen, T., Kottorp, A., Gay, C., Fagermoen, M., & Lerdal, A. (2013). Rasch analysis of the general self-efficacy scale in a sample of persons with morbid obesity. *Health and Quality of Life Outcomes, 11*(1), 202. <https://doi.org/10.1186/1477-7525-11-202>
- Borkovec, T. (1978). Self-efficacy: Cause or reflection of behavioral change? *Advances in Behaviour Research and Therapy, 1*(4), 163-170. [https://doi.org/10.1016/0146-6402\(78\)90003-6](https://doi.org/10.1016/0146-6402(78)90003-6)
- Boulton, A. J., & Williford, A. (2018). Analyzing skewed continuous outcomes with many zeros: A tutorial for social work and youth prevention science

researchers. *Journal of the Society for Social Work and Research*, 9(4), 721-740. <https://doi.org/10.1086/701235>

Branstetter-Rost, A., Cushing, C., & Douleh, T. (2009). Personal values and pain tolerance: Does a values intervention add to acceptance? *The Journal of Pain*, 10(8), 887-892. <https://doi.org/10.1016/j.jpain.2009.01.001>

Brassai, L., Piko, B. F., & Steger, M. F. (2015). A reason to stay healthy: The role of meaning in life in relation to physical activity and healthy eating among adolescents. *Journal of Health Psychology*, 20(5), 473-482. <https://doi.org/10.1177/1359105315576604>

Bricker, J. B., Mull, K. E., Kientz, J. A., Vilardaga, R., Mercer, L. D., Akioka, K. J., & Heffner, J. L. (2014). Randomized, controlled pilot trial of a smartphone app for smoking cessation using acceptance and commitment therapy. *Drug and Alcohol Dependence*, 143, 87-94. <https://doi.org/10.1016/j.drugalcdep.2014.07.006>

Bricker, J. B., Mull, K. E., Sullivan, B. M., & Forman, E. M. (2021). Efficacy of Telehealth acceptance and commitment therapy for weight loss: A pilot randomized clinical trial. *Translational Behavioral Medicine*. <https://doi.org/10.1093/tbm/ibab012>

Bricker, J., Wyszynski, C., Comstock, B., & Heffner, J. L. (2013). Pilot randomized controlled trial of web-based acceptance and commitment therapy for smoking cessation. *Nicotine & Tobacco Research*, 15(10), 1756-1764. <https://doi.org/10.1093/ntr/ntt056>

- Buckley, J. (2014). Exercise self-efficacy intervention in overweight and obese women. *Journal of Health Psychology, 21*(6), 1074-1084. <https://doi.org/10.1177/1359105314545096>
- Buford, T. W., Roberts, M. D., & Church, T. S. (2013). Toward exercise as personalized medicine. *Sports Medicine, 43*(3), 157-165. <https://doi.org/10.1007/s40279-013-0018-0>
- Bujang, M. A., Sa'at, N., & Sidik, T. M. (2017). Determination of Minimum Sample Size Requirement for Multiple Linear Regression and Analysis of Covariance Based on Experimental and Non-experimental Studies. *Epidemiology Biostatistics and Public Health, 14*(3). <https://doi.org/10.2427/12117>
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193-213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Calam, R., & Waller, G. (1998). Are eating and psychosocial characteristics in early teenage years useful predictors of eating characteristics in early adulthood? A 7-year longitudinal study. *International Journal of Eating Disorders, 24*(4), 351-362. [https://doi.org/10.1002/\(sici\)1098-108x\(199812\)24:4<351::aid-eat2>3.0.co;2-1](https://doi.org/10.1002/(sici)1098-108x(199812)24:4<351::aid-eat2>3.0.co;2-1)
- Carpenter, J. S., & Andrykowski, M. A. (1998). Psychometric evaluation of the pittsburgh sleep quality index. *Journal of Psychosomatic Research, 45*(1), 5-13. [https://doi.org/10.1016/S0022-3999\(97\)00298-5](https://doi.org/10.1016/S0022-3999(97)00298-5)

- Centers for Disease Control and Prevention (2019, November). *Disability and Risk Factors*. National Center for Health Statistics.
<https://www.cdc.gov/nchs/fastats/disability-and-risk-factors.htm>
- Centers for Disease Control and Prevention (2020, December 29). *Facts about moderate drinking*. <https://www.cdc.gov/alcohol/fact-sheets/moderate-drinking.htm>
- Centers for Disease Control and Prevention. (2016). *2016 NHIS Questionnaire - Sample Adult*. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Survey_Questionnaires/NHIS/2016/english/qadult.pdf
- Chase, J. A., Houmanfar, R., Hayes, S. C., Ward, T. A., Vilaradaga, J. P., & Follette, V. (2013). Values are not just goals: Online ACT-based values training adds to goal setting in improving undergraduate college student performance. *Journal of Contextual Behavioral Science*, 2(3-4), 79-84.
<https://doi.org/10.1016/j.jcbs.2013.08.002>
- Chow, H., & Yang, C. (2020). Accuracy of optical heart rate sensing technology in wearable fitness trackers for young and older adults: Validation and comparison study. *JMIR mHealth and uHealth*, 8(4), e14707. <https://doi.org/10.2196/14707>
- Clemens, K. S., Tull, M. T., Murray, A. B., Boardley, D., Tipton, J., & Geers, A. L. (2020). Examination of the relationship between affect, values, and physical activity among cancer survivors. *Journal of Contextual Behavioral Science*, 18, 68-74. <https://doi.org/10.1016/j.jcbs.2020.08.010>
- Clough, B. A., & Casey, L. M. (2011). Technological adjuncts to increase adherence to therapy: A review. *Clinical Psychology Review*, 31(5), 697-710. <https://doi.org/10.1016/j.cpr.2011.03.006>

- Cohen, J. (1962). The statistical power of abnormal-social psychological research: A review. *The Journal of Abnormal and Social Psychology*, 65(3), 145-153. <https://doi.org/10.1037/h0045186>
- Conn, V. S., Hafdahl, A. R., & Mehr, D. R. (2011). Interventions to increase physical activity among healthy adults: Meta-analysis of outcomes. *American Journal of Public Health*, 101(4), 751-758. <https://doi.org/10.2105/ajph.2010.194381>
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Pearson UK.
- Consort: Consolidated Standards in Reporting Trials. (2010). *The CONSORT Statement*. <http://www.consort-statement.org>
- Cotter, D. D. (2011). *Psychometric evaluation of the Valued Living Questionnaire: Comparing distressed and normative samples* [Doctoral dissertation]. <https://scholarworks.wmich.edu/dissertations/3089>
- Craig, C. L., Marshal, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports Exercise*, 35(8), 1381–1395. <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>
- Criddle, J. M., Howard, H., & Bordieri, M. (2021, July 24-27). In K. Webster (chair). *A Trial of a Daily Values Exercise on Participant Constructed Values and Valuing Behaviors*. Presented at the 2021 Association for Contextual Behavioral Science Virtual World Conference 19, online. https://contextualscience.org/2021_virtual_world_conference

- Csabonyi, M., & Phillips, L. J. (2017). Meaning in life and substance use. *Journal of Humanistic Psychology, 60*(1), 3-19. <https://doi.org/10.1177/0022167816687674>
- Curry, S. J., Wagner, E. H., & Grothaus, L. C. (1991). Evaluation of intrinsic and extrinsic motivation interventions with a self-help smoking cessation program. *Journal of Consulting and Clinical Psychology, 59*(2), 318-324. <https://doi.org/10.1037/0022-006x.59.2.318>
- Cyril, S., Smith, B. J., Possamai-Inesedy, A., & Renzaho, A. M. (2015). Exploring the role of community engagement in improving the health of disadvantaged populations: A systematic review. *Global Health Action, 8*(1), 29842. <https://doi.org/10.3402/gha.v8.29842>
- Czekierda, K., Banik, A., Park, C. L., & Luszczynska, A. (2017). Meaning in life and physical health: Systematic review and meta-analysis. *Health Psychology Review, 11*(4), 387-418. <https://doi.org/10.1080/17437199.2017.1327325>
- Dahl, J. (2015). Valuing in ACT. *Current Opinion in Psychology, 2*, 43-46. <https://doi.org/10.1016/j.copsyc.2015.03.001>
- DeVellis, R. F. (2006). Classical Test Theory. *Medical Care, 44*(11), S50-S59. <https://www.jstor.org/stable/41219505>
- de Zambotti, M., Claudatos, S., Inkelis, S., Colrain, I. M., & Baker, F. C. (2015). Evaluation of a consumer fitness-tracking device to assess sleep in adults. *Chronobiology International, 32*(7), 1024-1028. <https://doi.org/10.3109/07420528.2015.1054395>
- DiBello, A. M., Miller, M. B., & Carey, K. B. (2019). Self-efficacy to limit drinking mediates the association between attitudes and alcohol-related

outcomes. *Substance Use & Misuse*, 54(14), 2400-

2408. <https://doi.org/10.1080/10826084.2019.1653322>

DiClemente, C. C., Prochaska, J. O., Fairhurst, S. K., Velicer, W. F., Velasquez, M. M., & Rossi, J. S. (1991). The process of smoking cessation: An analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology*, 59(2), 295-304. <https://doi.org/10.1037/0022-006x.59.2.295>

Dochat, C., Wooldridge, J. S., Herbert, M. S., Lee, M. W., & Afari, N. (2021). Single-session acceptance and commitment therapy (ACT) interventions for patients with chronic health conditions: A systematic review and meta-analysis. *Journal of Contextual Behavioral Science*, 20, 52-69. <https://doi.org/10.1016/j.jcbs.2021.03.003>

Draper, M. R., Jennings, J., Baron, A., Erdur, O., & Shankar, L. (2002). Time-limited counseling outcome in a nationwide college counseling center sample. *Journal of College Counseling*, 5(1), 26-38. <https://doi.org/10.1002/j.2161-1882.2002.tb00204.x>

Edney, S., Ryan, J. C., Olds, T., Monroe, C., Fraysse, F., Vandelanotte, C., Plotnikoff, R., Curtis, R., & Maher, C. (2019). User engagement and attrition in an app-based physical activity intervention: Secondary analysis of a randomized controlled trial. *Journal of Medical Internet Research*, 21(11), e14645. <https://doi.org/10.2196/14645>

- Engeland, A., Bjørge, T., Tverdal, A., & Sjøgaard, A. J. (2004). Obesity in adolescence and adulthood and the risk of adult mortality. *Epidemiology, 15*(1), 79-85. <https://doi.org/10.1097/01.ede.0000100148.40711.59>
- Epton, T., Harris, P. R., Kane, R., Van Koningsbruggen, G. M., & Sheeran, P. (2015). The impact of self-affirmation on health-behavior change: A meta-analysis. *Health Psychology, 34*(3), 187-196. <https://doi.org/10.1037/hea0000116>
- Eysenbach, G. (2005). The Law of Attrition. *Journal of Medical Internet Research, 7*(1), e11. <https://doi.org/10.2196/jmir.7.1.e11>
- Fan, Z., Yang, Y., & Zhang, F. (2021). Association between health literacy and mortality: A systematic review and meta-analysis. *Archives of Public Health, 79*(1). <https://doi.org/10.1186/s13690-021-00648-7>
- Firestone, J., Cardaciotto, L., Levin, M. E., Goldbacher, E., Vernig, P., & Gambrel, L. E. (2019). A web-based self-guided program to promote valued-living in college students: A pilot study. *Journal of Contextual Behavioral Science, 12*, 29-38. <https://doi.org/10.1016/j.jcbs.2019.01.004>
- Fiorillo, D., McLean, C., Pistorello, J., Hayes, S. C., & Follette, V. M. (2017). Evaluation of a web-based acceptance and commitment therapy program for women with trauma-related problems: A pilot study. *Journal of Contextual Behavioral Science, 6*(1), 104-113. <https://doi.org/10.1016/j.jcbs.2016.11.003>
- Finkelstein-Fox, L., Pavlacic, J. M., Buchanan, E. M., Schulenberg, S. E., & Park, C. L. (2019). Valued living in daily experience: Relations with mindfulness, meaning, psychological flexibility, and stressors. *Cognitive Therapy and Research, 44*(2), 300-310. <https://doi.org/10.1007/s10608-019-10062-7>

- Flannery, M. (2017). Self-Determination Theory: Intrinsic Motivation and Behavioral Change. *Oncology Nursing Forum*, 44(2), 155-156. <https://dpo.org/10.1188/17.ONF.155-156>
- Friederichs, S. A., Bolman, C., Oenema, A., & Lechner, L. (2015). Profiling physical activity motivation based on self-determination theory: A cluster analysis approach. *BMC Psychology*, 3(1). <https://doi.org/10.1186/s40359-015-0059-2>
- Fryling, M. (2012). Relational Responding as a Psychological Event. *International Journal of Psychology and Psychological Therapy*, 12(1), 85-96. <https://www.redalyc.org/pdf/560/56023335006.pdf>
- Fung, K. (2014). Acceptance and commitment therapy: Western adoption of Buddhist tenets? *Transcultural Psychiatry*, 52(4), 561-576. <https://doi.org/10.1177/1363461514537544>
- Gardner, B., & Lally, P. (2012). Does intrinsic motivation strengthen physical activity habit? Modeling relationships between self-determination, past behaviour, and habit strength. *Journal of Behavioral Medicine*, 36(5), 488-497. <https://doi.org/10.1007/s10865-012-9442-0>
- Gaziano, T., Abrahams-Gessel, S., Surka, S., Sy, S., Pandya, A., Denman, C. A., Mendoza, C., Puoane, T., & Levitt, N. S. (2015). Cardiovascular disease screening by community health workers can be cost-effective in low-resource countries. *Health Affairs*, 34(9), 1538-1545. <https://doi.org/10.1377/hlthaff.2015.0349>

- Ghanvatkar, S., Kankanhalli, A., & Rajan, V. (2019). User models for personalized physical activity interventions: Scoping review. *JMIR mHealth and uHealth*, 7(1), e11098. <https://doi.org/10.2196/11098>
- Gloster, A. T., Walder, N., Levin, M. E., Twohig, M. P., & Karekla, M. (2020). The empirical status of acceptance and commitment therapy: A review of meta-analyses. *Journal of Contextual Behavioral Science*, 18, 181-192. <https://doi.org/10.1016/j.jcbs.2020.09.009>
- Glover, N. G., Sylvers, P. D., Shearer, E. M., Kane, M., Clasen, P. C., Epler, A. J., Plumb-Villardaga, J. C., Bonow, J. T., & Jakupcak, M. (2016). The efficacy of focused acceptance and commitment therapy in VA primary care. *Psychological Services*, 13(2), 156-161. <https://doi.org/10.1037/ser0000062>
- Gmel, G., & Daeppen, J. (2007). Recall bias for seven-day recall measurement of alcohol consumption among emergency department patients: Implications for case-crossover designs*. *Journal of Studies on Alcohol and Drugs*, 68(2), 303-310. <https://doi.org/10.15288/jsad.2007.68.303>
- González-Menéndez, A., Fernández, P., Rodríguez, F., & Villagrà, P. (2014). Long-term outcomes of acceptance and commitment therapy in drug-dependent female inmates: A randomized controlled trial. *International Journal of Clinical and Health Psychology*, 14(1), 18-27. [https://doi.org/10.1016/s1697-2600\(14\)70033-x](https://doi.org/10.1016/s1697-2600(14)70033-x)
- Gourlan, M., Trouilloud, D., & Boiché, J. (2015). Motivational profiles for physical activity practice in adults with type 2 diabetes: A self-determination theory perspective. *Behavioral Medicine*, 42(4), 227-237. <https://doi.org/10.1080/08964289.2014.1001810>

- Gray, K. M., & Squeglia, L. M. (2017). Research review: What have we learned about adolescent substance use? *Journal of Child Psychology and Psychiatry*, *59*(6), 618-627. <https://doi.org/10.1111/jcpp.12783>
- Gregg, J. A., Namekata, M. S., Louie, W. A., & Chancellor-Freeland, C. (2014). Impact of values clarification on cortisol reactivity to an acute stressor. *Journal of Contextual Behavioral Science*, *3*(4), 299-304. <https://doi.org/10.1016/j.jcbs.2014.08.002>
- Grégoire, S., Doucerain, M., Morin, L., & Finkelstein-Fox, L. (2021). The relationship between value-based actions, psychological distress and well-being: A multilevel diary study. *Journal of Contextual Behavioral Science*, *20*, 79-88. <https://doi.org/10.1016/j.jcbs.2021.03.006>
- Hacker, T., Stone, P., & MacBeth, A. (2016). Acceptance and commitment therapy – Do we know enough? Cumulative and sequential meta-analyses of randomized controlled trials. *Journal of Affective Disorders*, *190*, 551-565. <https://doi.org/10.1016/j.jad.2015.10.053>
- Hafner, H. A. (2018). *Differences among College Students' Eating Habits with and without a Meal Plan (10814118)* [Master's thesis]. ProQuest Dissertations and Theses Global.
- Hagströmer, M., Oja, P., & Sjöström, M. (2006). The international physical activity questionnaire (IPAQ): A study of concurrent and construct validity. *Public Health Nutrition*, *9*(6), 755-762. <https://doi.org/10.1079/phn2005898>
- Harris, J. D., Brand, J. C., Cote, M. P., Faucett, S. C., & Dhawan, A. (2017). Research pearls: The significance of statistics and perils of pooling. Part 1: Clinical versus

- statistical significance. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 33(6), 1102-1112. <https://doi.org/10.1016/j.arthro.2017.01.053>
- Harris, R. (2019). *ACT made simple: An easy-to-Read primer on acceptance and commitment therapy*. New Harbinger Publications.
- Harris, R. (2008). *Values Worksheet*. The Happiness Trap 8-Week Online Program. https://thehappinesstrap.com/upimages/Values_Questionnaire.pdf
- Harris, P. R., & Napper, L. (2005). Self-affirmation and the biased processing of threatening health-risk information. *Personality and Social Psychology Bulletin*, 31(9), 1250-1263. <https://doi.org/10.1177/0146167205274694>
- Herzog, T. A., & Blagg, C. O. (2007). Are most precontemplators contemplating smoking cessation? Assessing the validity of the stages of change. *Health Psychology*, 26(2), 222-231. <https://doi.org/10.1037/0278-6133.26.2.222>
- Hasselmann, F., & Bosman, A. M. (2020). Studying complex adaptive systems with internal states: A recurrence network approach to the analysis of multivariate time-series data representing self-reports of human experience. *Frontiers in Applied Mathematics and Statistics*, 6. <https://doi.org/10.3389/fams.2020.00009>
- Hawkins, R. M. (1992). Self-efficacy: A predictor but not a cause of behavior. *Journal of Behavior Therapy and Experimental Psychiatry*, 23(4), 251-256. [https://doi.org/10.1016/0005-7916\(92\)90047-m](https://doi.org/10.1016/0005-7916(92)90047-m)
- Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. *Behavior Therapy*, 35(4), 639-665. [https://doi.org/10.1016/s0005-7894\(04\)80013-3](https://doi.org/10.1016/s0005-7894(04)80013-3)

- Hayes, S. C. (1989). *Rule-governed behavior: Cognition, contingencies, and instructional control*. Springer.
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-skinnerian account of human language and cognition*. Springer Science & Business Media.
- Hayes, S. C., Follette, V. M., & Linehan, M. M. (2011). *Mindfulness and acceptance: Expanding the cognitive-behavioral tradition*. Guilford Press.
- Hayes, S. C., Hofmann, S. G., Stanton, C. E., Carpenter, J. K., Sanford, B. T., Curtiss, J. E., & Ciarrochi, J. (2019). The role of the individual in the coming era of process-based therapy. *Behaviour Research and Therapy*, *117*, 40-53. <https://doi.org/10.1016/j.brat.2018.10.005>
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*(1), 1-25. <https://doi.org/10.1016/j.brat.2005.06.006>
- Hayes, S. C., Pistorello, J., & Levin, M. E. (2012). Acceptance and commitment therapy as a unified model of behavior change. *The Counseling Psychologist*, *40*(7), 976-1002. <https://doi.org/10.1177/0011000012460836>
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.). Guilford Publications.
- Hayes, S. C., & Strosahl, K. D. (2013). *A practical guide to acceptance and commitment therapy*. Springer Science & Business Media.

- Heath, G. W., Parra, D. C., Sarmiento, O. L., Andersen, L. B., Owen, N., Goenka, S., Montes, F., & Brownson, R. C. (2012). Evidence-based intervention in physical activity: Lessons from around the world. *The Lancet*, *380*(9838), 272-281. [https://doi.org/10.1016/s0140-6736\(12\)60816-2](https://doi.org/10.1016/s0140-6736(12)60816-2)
- Hebert, E. R., Flynn, M. K., Wilson, K. G., & Kellum, K. K. (2021). Values intervention as an establishing operation for approach in the presence of aversive stimuli. *Journal of Contextual Behavioral Science*, *20*, 144-154. <https://doi.org/10.1016/j.jcbs.2021.04.001>
- Heron, K. E., & Smyth, J. M. (2010). Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *British Journal of Health Psychology*, *15*(1), 1-39. <https://doi.org/10.1348/135910709x466063>
- Hofmann, S. G., Curtiss, J. E., & Hayes, S. C. (2020). Beyond linear mediation: Toward a dynamic network approach to study treatment processes. *Clinical Psychology Review*, *76*, 101824. <https://doi.org/10.1016/j.cpr.2020.101824>
- Holman, G., & Koerner, K. (2014). Single case designs in clinical practice: A contemporary CBS perspective on why and how to. *Journal of Contextual Behavioral Science*, *3*(2), 138-147. <https://doi.org/10.1016/j.jcbs.2014.04.006>
- Hooker, S. A., & Masters, K. S. (2014). Purpose in life is associated with physical activity measured by accelerometer. *Journal of Health Psychology*, *21*(6), 962-971. <https://doi.org/10.1177/1359105314542822>
- Hooker, S. A., Masters, K. S., & Ranby, K. W. (2020). Integrating meaning in life and self-determination theory to predict physical activity adoption in previously

inactive exercise initiates enrolled in a randomized trial. *Psychology of Sport and Exercise*, 49, 101704. <https://doi.org/10.1016/j.psychsport.2020.101704>

Huberty, C. J., & Morris, J. D. (1992). Multivariate analysis versus multiple univariate analyses. *Methodological issues & strategies in clinical research*, 351-365. <https://doi.org/10.1037/10109-030>

Hughes, S., & Barnes-Holmes, D. (2016). Relational frame theory: The basic account. In R. D. Zettle, S. C. Hayes, D. Barnes-Holmes, & A. Biglan (Eds.), *The Wiley handbook of contextual behavioral science* (pp. 129–178). Wiley Blackwell.

Ivanova, E., Jensen, D., Cassoff, J., Gu, F., & Knäuper, B. (2015). Acceptance and commitment therapy improves exercise tolerance in sedentary women. *Medicine & Science in Sports & Exercise*, 47(6), 1251-1258. <https://doi.org/10.1249/mss.0000000000000536>

Jackson, M. L., Larry Williams, W., Hayes, S. C., Humphreys, T., Gauthier, B., & Westwood, R. (2016). Whatever gets your heart pumping: The impact of implicitly selected reinforcer-focused statements on exercise intensity. *Journal of Contextual Behavioral Science*, 5(1), 48-57. <https://doi.org/10.1016/j.jcbs.2015.11.002>

Järvelä-Reijonen, E., Karhunen, L., Sairanen, E., Muotka, J., Lindroos, S., Laitinen, J., Puttonen, S., Peuhkuri, K., Hallikainen, M., Pihlajamäki, J., Korpela, R., Ermes, M., Lappalainen, R., & Kolehmainen, M. (2018). The effects of acceptance and commitment therapy on eating behavior and diet delivered through face-to-face contact and a mobile app: A randomized controlled

trial. *International Journal of Behavioral Nutrition and Physical Activity*, 15(1). <https://doi.org/10.1186/s12966-018-0654-8>

- Jeffers, A. J., Mason, T. B., & Benotsch, E. G. (2019). Psychological eating factors, affect, and ecological momentary assessed diet quality. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 25(5), 1151-1159. <https://doi.org/10.1007/s40519-019-00743-3>
- Johnson, F., Wardle, J., & Griffith, J. (2002). The adolescent food habits checklist: Reliability and validity of a measure of healthy eating behaviour in adolescents. *European Journal of Clinical Nutrition*, 56(7), 644-649. <https://doi.org/10.1038/sj.ejcn.1601371>
- Jones, R. D., Asare, M., & Lanning, B. (2020). A retrospective cross-sectional study on the prevalence of E-cigarette use among college students. *Journal of Community Health*, 46(1), 195-202. <https://doi.org/10.1007/s10900-020-00869-x>
- Jordan, D. G., Winer, E. S., & Salem, T. (2020). The current status of temporal network analysis for clinical science: Considerations as the paradigm shifts? *Journal of Clinical Psychology*, 76(9), 1591-1612. <https://doi.org/10.1002/jclp.22957>
- Joseph, K. L., Dagfinrud, H., Christie, A., Hagen, K. B., & Tvetter, A. T. (2021). Criterion validity of the international physical activity questionnaire-short form (IPAQ-SF) for use in clinical practice in patients with osteoarthritis. *BMC Musculoskeletal Disorders*, 22(1). <https://doi.org/10.1186/s12891-021-04069-z>
- Juarascio, A. S., Forman, E. M., & Herbert, J. D. (2010). Acceptance and commitment therapy versus cognitive therapy for the treatment of comorbid eating

pathology. *Behavior Modification*, 34(2), 175-

190. <https://doi.org/10.1177/0145445510363472>

Kahwati, L., Viswanathan, M., Golin, C. E., Kane, H., Lewis, M., & Jacobs, S. (2016).

Identifying configurations of behavior change techniques in effective medication adherence interventions: A qualitative comparative analysis. *Systematic*

Reviews, 5(1). <https://doi.org/10.1186/s13643-016-0255-z>

Kalkan, I. (2019). The impact of nutrition literacy on the food habits among young adults

in Turkey. *Nutrition Research and Practice*, 13(4),

352. <https://doi.org/10.4162/nrp.2019.13.4.352>

Kane, R. L., Johnson, P. E., Town, R. J., & Butler, M. (2004). A structured review of the

effect of economic incentives on consumers' preventive behavior. *American Journal of Preventive Medicine*, 27(4), 327-

352. <https://doi.org/10.1016/j.amepre.2004.07.002>

Karatay, G., & Gürarlan Baş, N. (2017). Effects of role-playing scenarios on the self-

efficacy of students in resisting against substance addiction: A pilot

study. *INQUIRY: The Journal of Health Care Organization, Provision, and*

Financing, 54. <https://doi.org/10.1177/0046958017720624>

Kanzler, K. E., Robinson, P. J., McGeary, D. D., Mintz, J., Kilpela, L. S., Finley, E. P.,

McGeary, C., Lopez, E. J., Velligan, D., Munante, M., Tsevat, J., Houston, B.,

Mathias, C. W., Potter, J. S., & Pugh, J. (2022). Addressing chronic pain with

focused acceptance and commitment therapy in integrated primary care: Findings

from a mixed methods pilot randomized controlled trial. *BMC Primary*

Care, 23(1). <https://doi.org/10.1186/s12875-022-01690-2>

- Kim, E. S., Hershner, S. D., & Strecher, V. J. (2015). Purpose in life and incidence of sleep disturbances. *Journal of Behavioral Medicine, 38*(3), 590-597. <https://doi.org/10.1007/s10865-015-9635-4>
- Kissi, A., Hughes, S., Mertens, G., Barnes-Holmes, D., De Houwer, J., & Crombez, G. (2017). A systematic review of Pliance, tracking, and augmenting. *Behavior Modification, 41*(5), 683-707. <https://doi.org/10.1177/0145445517693811>
- Kohtala, A., Lappalainen, R., Savonen, L., Timo, E., & Tolvanen, A. (2013). A four-session acceptance and commitment therapy based intervention for depressive symptoms delivered by masters degree level psychology students: A preliminary study. *Behavioural and Cognitive Psychotherapy, 43*(3), 360-373. <https://doi.org/10.1017/s1352465813000969>
- Krafft, J., Potts, S., Schoendorff, B., & Levin, M. E. (2017). A randomized controlled trial of multiple versions of an acceptance and commitment therapy matrix app for well-being. *Behavior Modification, 43*(2), 246-272. <https://doi.org/10.1177/0145445517748561>
- Kurtines, W. M., Alvarez, M., & Azmitia, M. (1990). Science and morality: The role of values in science and the scientific study of moral phenomena. *Psychological Bulletin, 107*(3), 283-295. <https://doi.org/10.1037/0033-2909.107.3.283>
- Lappalainen, R., & Kolehmainen, M. (2018). The effects of acceptance and commitment therapy on eating behavior and diet delivered through face-to-face contact and a mobile app: A randomized controlled trial. *International Journal of Behavioral Nutrition and Physical Activity, 15*(1). <https://doi.org/10.1186/s12966-018-0654-8>

- Lappalainen, P., Langrial, S., Oinas-Kukkonen, H., Muotka, J., & Lappalainen, R. (2019). ACT for sleep - internet-delivered self-help ACT for sub-clinical and clinical insomnia: A randomized controlled trial. *Journal of Contextual Behavioral Science, 12*, 119-127. <https://doi.org/10.1016/j.jcbs.2019.04.001>
- Lawrence, E. M. (2017). Why do college graduates behave more healthfully than those who are less educated? *Journal of Health and Social Behavior, 58*(3), 291-306. <https://doi.org/10.1177/0022146517715671>
- Lazev, A., Vidrine, D., Arduino, R., & Gritz, E. (2004). Increasing access to smoking cessation treatment in a low-income, HIV-positive population: The feasibility of using cellular telephones. *Nicotine & Tobacco Research, 6*(2), 281-286. <https://doi.org/10.1080/14622200410001676314>
- Lazić, M., Jovanović, V., & Gavrilov-Jerković, V. (2018). The general self-efficacy scale: New evidence of structural validity, measurement invariance, and predictive properties in relationship to subjective well-being in Serbian samples. *Current Psychology, 40*(2), 699-710. <https://doi.org/10.1007/s12144-018-9992-6>
- Lederer, A. M., & Oswalt, S. B. (2017). The value of college health promotion: A critical population and setting for improving the public's health. *American Journal of Health Education, 48*(4), 215-218. <https://doi.org/10.1080/19325037.2017.1316692>
- Lee, E. B., An, W., Levin, M. E., & Twohig, M. P. (2015). An initial meta-analysis of acceptance and commitment therapy for treating substance use disorders. *Drug*

and Alcohol Dependence, 155, 1-7.

<https://doi.org/10.1016/j.drugalcdep.2015.08.004>

Letourneau, B., Sobell, L. C., Sobell, M. B., Agrawal, S., & Gioia, C. J. (2017). Two brief measures of alcohol use produce different results: AUDIT-C and quick drinking screen. *Alcoholism: Clinical and Experimental Research*, 41(5), 1035-1043. <https://doi.org/10.1111/acer.13364>

Lerner, R. M., Fisher, C. B., & Weinberg, R. A. (2000). Toward a science for and of the people: Promoting civil society through the application of developmental science. *Child Development*, 71(1), 11-20. <https://doi.org/10.1111/1467-8624.00113>

Levin, M. E., Hildebrandt, M. J., Lillis, J., & Hayes, S. C. (2012). The Impact of Treatment Components Suggested by the Psychological Flexibility Model: A Meta-Analysis of Laboratory-Based Component Studies. *Behavior Therapy*, 43(4), 741–756. <https://doi.org/10.1016/j.beth.2012.05.003>

Levin, M. E., Krafft, J., Hicks, E. T., Pierce, B., & Twohig, M. P. (2020). A randomized dismantling trial of the open and engaged components of acceptance and commitment therapy in an online intervention for distressed college students. *Behaviour Research and Therapy*, 126, 103557. <https://doi.org/10.1016/j.brat.2020.103557>

Levin, M. E., Pierce, B., & Schoendorff, B. (2017). The acceptance and commitment therapy matrix mobile app: A pilot randomized trial on health behaviors. *Journal of Contextual Behavioral Science*, 6(3), 268-275. <https://doi.org/10.1016/j.jcbs.2017.05.003>

- Li, H., Wu, J., Ni, ., Zhang, J., Wang, Y., & He, G. (2021). Systematic review and meta-analysis of effectiveness of acceptance and commitment therapy in patients with breast cancer. *Nursing Research, Publish Ahead of Print*. <https://doi.org/10.1097/nnr.0000000000000499>
- Lillis, J., Dunsiger, S., Thomas, J. G., Ross, K. M., & Wing, R. R. (2021). Novel behavioral interventions to improve long-term weight loss: A randomized trial of acceptance and commitment therapy or self-regulation for weight loss maintenance. *Journal of Behavioral Medicine*. <https://doi.org/10.1007/s10865-021-00215-z>
- Linardon, J. (2018). The relationship between dietary restraint and binge eating: Examining eating-related self-efficacy as a moderator. *Appetite, 127*, 126-129. <https://doi.org/10.1016/j.appet.2018.04.026>
- Linardon, J., Fitzsimmons-Craft, E. E., Brennan, L., Barillaro, M., & Wilfley, D. E. (2018). Dropout from interpersonal psychotherapy for mental health disorders: A systematic review and meta-analysis. *Psychotherapy Research, 29*(7), 870-881. <https://doi.org/10.1080/10503307.2018.1497215>
- Linardon, J., Gleeson, J., Yap, K., Murphy, K., & Brennan, L. (2018). Meta-analysis of the effects of third-wave behavioural interventions on disordered eating and body image concerns: Implications for eating disorder prevention. *Cognitive Behaviour Therapy, 48*(1), 15-38. <https://doi.org/10.1080/16506073.2018.1517389>
- Litman, L., Rosen, Z., Spierer, D., Weinberger-Litman, S., Goldschein, A., & Robinson, J. (2015). Mobile exercise apps and increased leisure time exercise activity: A moderated mediation analysis of the role of self-efficacy and

- barriers. *Journal of Medical Internet Research*, 17(8), e195. <https://doi.org/10.2196/jmir.4142>
- Lowie, W. M., & Verspoor, M. H. (2018). Individual differences and the ergodicity problem. *Language Learning*, 69, 184-206. <https://doi.org/10.1111/lang.12324>
- Louisiana Contextual Science Research Group (2022). Beyond checking: A behavioral conceptualization of privilege as a manipulable context. *Behavior and Social Issues Special Section on Diversity and Inclusion*. <https://doi.org/10.1007/s42822-022-00091-5>
- Lustria, M. L., Noar, S. M., Cortese, J., Van Stee, S. K., Glueckauf, R. L., & Lee, J. (2013). A meta-analysis of web-delivered tailored health behavior change interventions. *Journal of Health Communication*, 18(9), 1039-1069. <https://doi.org/10.1080/10810730.2013.768727>
- Mason, M., Ola, B., Zaharakis, N., & Zhang, J. (2014). Text messaging interventions for adolescent and young adult substance use: A meta-analysis. *Prevention Science*, 16(2), 181-188. <https://doi.org/10.1007/s11121-014-0498-7>
- McAuley, E., Lox, C., Rudolph, D., & Travis, A. (1994). Self-efficacy and intrinsic motivation in exercising middle-aged adults. *Journal of Applied Gerontology*, 13(4), 355-370. <https://doi.org/10.1177/073346489401300402>
- Metcalf, M., Rossie, K., Stokes, K., Tallman, C., & Tanner, B. (2018). Virtual reality cue refusal video game for alcohol and cigarette recovery support: Summative study. *JMIR Serious Games*, 6(2), e7. <https://doi.org/10.2196/games.9231>
- Meyerowitz-Katz, G., Ravi, S., Arnolda, L., Feng, X., Maberly, G., & Astell-Burt, T. (2020). Rates of attrition and dropout in app-based interventions for chronic

- disease: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 22(9), e20283. <https://doi.org/10.2196/20283>
- Miao, M., Gan, Y., Gan, T., & Zhou, G. (2016). Carry-over effect between diet and physical activity: The bottom-up and top-down hypotheses of hierarchical self-efficacy. *Psychology, Health & Medicine*, 22(3), 266-274. <https://doi.org/10.1080/13548506.2016.1160134>
- Michael, J. (1993). Establishing operations. *Behavior Analysis*, 16(2), 191-206. <https://doi.org/10.1007/BF03392623>
- Michelson, S. E., Lee, J. K., Orsillo, S. M., & Roemer, L. (2011). The role of values-consistent behavior in generalized anxiety disorder. *Depression and Anxiety*, 28(5), 358-366. <https://doi.org/10.1002/da.20793>
- Middelkamp, J., Van Rooijen, M., Wolfhagen, P., & Steenbergen, B. (2017). The Effects of a self-efficacy intervention on exercise behavior of fitness club members in 52 weeks and long-term relationships of transtheoretical model constructs. *Journal of Sports Science Medicine*, 16(2), 163-171. [PMCID: PMC5465977](https://pubmed.ncbi.nlm.nih.gov/31546597/)
- Miller, B. M., & Brennan, L. (2015). Measuring and reporting attrition from obesity treatment programs: A call to action! *Obesity Research & Clinical Practice*, 9(3), 187-202. <https://doi.org/10.1016/j.orcp.2014.08.007>
- Miller, C. M., Whitley, R. B., Scully, K. A., Madson, M. B., & Zeigler-Hill, V. (2019). Protective behavioral strategies and alcohol-related outcomes: The moderating effects of drinking refusal self-efficacy and sex. *Addictive Behaviors*, 99, 106110. <https://doi.org/10.1016/j.addbeh.2019.106110>

- Moffitt, R., & Mohr, P. (2014). The efficacy of a self-managed acceptance and commitment therapy intervention DVD for physical activity initiation. *British Journal of Health Psychology*, 20(1), 115-129. <https://doi.org/10.1111/bjhp.12098>
- Molenaar, P. C. (2007). On the implications of the classical ergodic theorems: Analysis of developmental processes has to focus on intra-individual variation. *Developmental Psychobiology*, 50(1), 60-69. <https://doi.org/10.1002/dev.20262>
- Morton, K., Beauchamp, M., Prothero, A., Joyce, L., Saunders, L., Spencer-Bowdage, S., Dancy, B., & Pedlar, C. (2014). The effectiveness of motivational interviewing for health behaviour change in primary care settings: A systematic review. *Health Psychology Review*, 9(2), 205-223. <https://doi.org/10.1080/17437199.2014.882006>
- Morton, J., Snowdon, S., Gopold, M., & Guymer, E. (2012). Acceptance and commitment therapy group treatment for symptoms of borderline personality disorder: A public sector pilot study. *Cognitive and Behavioral Practice*, 19(4), 527-544. <https://doi.org/10.1016/j.cbpra.2012.03.005>
- Nam, S., & Toneatto, T. (2016). The influence of attrition in evaluating the efficacy and effectiveness of mindfulness-based interventions. *International Journal of Mental Health and Addiction*, 14(6), 969-981. <https://doi.org/10.1007/s11469-016-9667-1>
- Nam, S., Whittmore, , & Duncton, G. (2019). R., Vlahov, 824-P: Ecological momentary assessment of diabetes self-management: A systematic review of methods and procedures. *Diabetes*, 68(Supplement_1). <https://doi.org/10.2337/db19-824-p>

- National Institute on Drug Abuse (2021, June 10). *Cigarettes and other tobacco products DrugFacts*. <https://www.drugabuse.gov/publications/drugfacts/cigarettes-other-tobacco-products>
- National Institute on Drug Abuse (2019, September 13). *Drug and alcohol use in college-age adults in 2018*. <https://www.drugabuse.gov/drug-topics/trends-statistics/infographics/drug-alcohol-use-in-college-age-adults-in-2018>
- National Institutes of Health. (2011, August). *Your guide to healthy sleep*. Advancing Heart, Lung, Blood, and Sleep Research & Innovation | NHLBI, NIH. https://www.nhlbi.nih.gov/files/docs/public/sleep/healthy_sleep.pdf
- National Opinion Research Center at the University of Chicago. (2018, March 26). *New survey finds large number of people skipping necessary medical care because of cost* / NORC.org. <https://www.norc.org/NewsEventsPublications/PressReleases/Pages/survey-finds-large-number-of-people-skipping-necessary-medical-care-because-cost.aspx>
- Neal, D. J., & Simons, J. S. (2007). Inference in regression models of heavily skewed alcohol use data: A comparison of ordinary least squares, generalized linear models, and bootstrap resampling. *Psychology of Addictive Behaviors*, 21(4), 441-452. <https://doi.org/10.1037/0893-164x.21.4.441>
- Newman, M. G., Przeworski, A., Consoli, A. J., & Taylor, C. B. (2015). A randomized controlled trial of ecological momentary intervention plus brief group therapy for generalized anxiety disorder. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2555280>

- Noyes, E. T., Levine, J. A., Schlauch, R. C., Crane, C. A., Connors, G. J., Maisto, S. A., & Dearing, R. L. (2018). Impact of Pretreatment change on mechanism of behavior change research: An applied example using alcohol abstinence self-efficacy. *Journal of Studies on Alcohol and Drugs*, 79(2), 223-228. <https://doi.org/10.15288/jsad.2018.79.223>
- O'Connor, M., Tennyson, A., Timmons, M., & McHugh, L. (2019). The development and preliminary psychometric properties of the values wheel. *Journal of Contextual Behavioral Science*, 12, 39-46. <https://doi.org/10.1016/j.jcbs.2019.01.005>
- O'Reilly, S. L., & McCann, L. R. (2012). Development and validation of the diet quality tool for use in cardiovascular disease prevention settings. *Australian Journal of Primary Health*, 18(2), 138. <https://doi.org/10.1071/py11005>
- Páez-Blarrina, M., Luciano, C., Gutiérrez-Martínez, O., Valdivia, S., Ortega, J., & Rodríguez-Valverde, M. (2008). The role of values with personal examples in altering the functions of pain: Comparison between acceptance-based and cognitive-control-based protocols. *Behaviour Research and Therapy*, 46(1), 84-97. <https://doi.org/10.1016/j.brat.2007.10.008>
- Pankowski, S., Adler, M., Andersson, G., Lindefors, N., & Svanborg, C. (2016). Group acceptance and commitment therapy (ACT) for bipolar disorder and Co-existing anxiety – an open pilot study. *Cognitive Behaviour Therapy*, 46(2), 114-128. <https://doi.org/10.1080/16506073.2016.1231218>

- Patterson, C. J., & Potter, E. C. (2019). Sexual orientation and sleep difficulties: A review of research. *Sleep Health*, 5(3), 227-235. <https://doi.org/10.1016/j.sleh.2019.02.004>
- Petersen, C. L., & Zettle, R. D. (2009). Treating inpatients with comorbid depression and alcohol use disorders: A comparison of acceptance and commitment therapy versus treatment as usual. *The Psychological Record*, 59(4), 521-536. <https://doi.org/10.1007/bf03395679>
- Plumb, J. C., Stewart, I., Dahl, J., & Lundgren, T. (2009). In search of meaning: Values in modern clinical behavior analysis. *The Behavior Analyst*, 32(1), 85-103. <https://doi.org/10.1007/bf0339217>
- Postel, M. G., De Haan, H. A., Ter Huurne, E. D., Van der Palen, J., Becker, E. S., & De Jong, C. A. (2011). Attrition in web-based treatment for problem drinkers. *Journal of Medical Internet Research*, 13(4), e117. <https://doi.org/10.2196/jmir.1811>
- Potts, S., Krafft, J., & Levin, M. E. (2020). A pilot randomized controlled trial of acceptance and commitment therapy guided self-help for overweight and obese adults high in weight self-stigma. *Behavior Modification*, 46(1), 178-201. <https://doi.org/10.1177/0145445520975112>
- Prestwich, A., Kellar, I., Parker, R., MacRae, S., Learmonth, M., Sykes, B., Taylor, N., & Castle, H. (2013). How can self-efficacy be increased? meta-analysis of dietary interventions. *Health Psychology Review*, 8(3), 270-285. <https://doi.org/10.1080/17437199.2013.813729>

- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395. <https://doi.org/10.1037/0022-006x.51.3.390>
- Prochaska, J. O., Wright, J. A., & Velicer, W. F. (2008). Evaluating theories of health behavior change: A hierarchy of criteria applied to the transtheoretical model. *Applied Psychology, 57*(4), 561-588. <https://doi.org/10.1111/j.1464-0597.2008.00345.x>
- Rahal, G., & Gon, C. (2020). A Systematic Review of Values Interventions in Acceptance and Commitment Therapy. *International Journal of Psychology and Psychological Therapy, 20*(3), 355-372.
- Ranganathan, P., Pramesh, C., & Buyse, M. (2015). Common pitfalls in statistical analysis: Clinical versus statistical significance. *Perspectives in Clinical Research, 6*(3), 169. <https://doi.org/10.4103/2229-3485.159943>
- Ranstam, J., Turkiewicz, A., Boonen, S., Van Meirhaeghe, J., Bastian, L., & Wardlaw, D. (2012). Alternative analyses for handling incomplete follow-up in the intention-to-treat analysis: The randomized controlled trial of balloon kyphoplasty versus non-surgical care for vertebral compression fracture (FREE). *BMC Medical Research Methodology, 12*(1). <https://doi.org/10.1186/1471-2288-12-35>
- Reilly, J. J., & Kelly, J. (2010). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: Systematic review. *International Journal of Obesity, 35*(7), 891-898. <https://doi.org/10.1038/ijo.2010.222>

- Reilly, E. D., Ritzert, T. R., Scoglio, A. A., Mote, J., Fukuda, S. D., Ahern, M. E., & Kelly, M. M. (2019). A systematic review of values measures in acceptance and commitment therapy research. *Journal of Contextual Behavioral Science, 12*, 290-304. <https://doi.org/10.1016/j.jcbs.2018.10.004>
- Resnicow, K., McCarty, F., & Baranowski, T. (2003). Are precontemplators less likely to change their dietary behavior? A prospective analysis. *Health Education Research, 18*(6), 693-705. <https://doi.org/10.1093/her/cyf052>
- Reljic, D., Lampe, D., Wolf, F., Zopf, Y., Herrmann, H. J., & Fischer, J. (2019). Prevalence and predictors of dropout from high-intensity interval training in sedentary individuals: A meta-analysis. *Scandinavian Journal of Medicine & Science in Sports, 29*(9), 1288-1304. <https://doi.org/10.1111/sms.13452>
- Rickardsson, J., Gentili, C., Holmström, L., Zetterqvist, V., Andersson, E., Persson, J., Lekander, M., Ljótsson, B., & Wicksell, R. K. (2021). Internet-delivered acceptance and commitment therapy as microlearning for chronic pain: A randomized controlled trial with 1-year follow-up. *European Journal of Pain, 25*(5), 1012-1030. <https://doi.org/10.1002/ejp.1723>
- Rolffs, J. L., Rogge, R. D., & Wilson, K. G. (2016). Disentangling components of flexibility via the Hexaflex model: Development and validation of the multidimensional psychological flexibility inventory (MPFI). *Assessment, 25*(4), 458-482. <https://doi.org/10.1177/1073191116645905>
- Ross, A. M., & Melzer, T. (2016). Beliefs as barriers to healthy eating and physical activity. *Australian Journal of Psychology, 68*(4), 251-260. <https://doi.org/10.1111/ajpy.12103>

- Ruiz, F. (2012). Acceptance and commitment therapy versus traditional cognitive behavioral therapy: A systematic review and meta-analysis of current empirical evidence. *Journal of Psychology and Psychological Therapy, 12*, 333-357.
- Ruiz, F. J., Peña-Vargas, A., Ramírez, E. S., Suárez-Falcón, J. C., García-Martín, M. B., García-Beltrán, D. M., Henao, Á. M., Monroy-Cifuentes, A., & Sánchez, P. D. (2020). Efficacy of a two-session repetitive negative thinking-focused acceptance and commitment therapy (ACT) protocol for depression and generalized anxiety disorder: A randomized waitlist control trial. *Psychotherapy, 57*(3), 444-456. <https://doi.org/10.1037/pst0000273>
- Sakano, A., Ohya, A., & Muto, T. (2021). Effects of values on pain tolerance and activity under a laboratory-induced pain condition. *Japanese Psychological Research. <https://doi.org/10.1111/jpr.12340>*
- Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport, 71*(sup2), 1-14. <https://doi.org/10.1080/02701367.2000.11082780>
- Samendinger, S., Hill, C. R., Hepler, T. J., & Feltz, D. L. (2019). Why residuals are important in the self-efficacy–performance relationship analysis: A study across 12 cycling sessions. *Journal of Physical Activity and Health, 16*(6), 455-460. <https://doi.org/10.1123/jpah.2018-0386>
- Sander, A. M., Clark, A. N., Arciniegas, D. B., Tran, K., Leon-Novelo, L., Ngan, E., Bogaards, J., Sherer, M., & Walser, R. (2020). A randomized controlled trial of acceptance and commitment therapy for psychological distress among persons

- with traumatic brain injury. *Neuropsychological Rehabilitation*, 31(7), 1105-1129. <https://doi.org/10.1080/09602011.2020.1762670>
- Sanford, B. T., Ciarrochi, J., Hofmann, S. G., Chin, F., Gates, K. M., & Hayes, S. C. (2022). Toward empirical process-based case conceptualization: An idionomic network examination of the process-based assessment tool. *Journal of Contextual Behavioral Science*. <https://doi.org/10.1016/j.jcbs.2022.05.006>
- Schwarzer, R., & Jerusalem, M. (1995). General self-efficacy scale. *PsycTESTS Dataset*. <https://doi.org/10.1037/t00393-000>
- Sheeran, P., Klein, W. M., & Rothman, A. J. (2017). Health behavior change: Moving from observation to intervention. *Annual Review of Psychology*, 68(1), 573-600. <https://doi.org/10.1146/annurev-psych-010416-044007>
- Sherer, M., & Maddux, J. (1982). The self-efficacy scale: construction and validation. *Psychological Reports*, 51, 662-671.
- Shieh, G. (2019). Power analysis and sample size planning in ANCOVA designs. *Psychometrika*, 85(1), 101-120. <https://doi.org/10.1007/s11336-019-09692-3>
- Shore, B. J., Nasreddine, A. Y., & Kocher, M. S. (2012). Overcoming the funding challenge: The cost of randomized controlled trials in the next decade. *Journal of Bone and Joint Surgery*, 94(Supplement_1), 101-106. <https://doi.org/10.2106/jbjs.1.00193>
- Sitzmann, T., & Yeo, G. (2013). A meta-analytic investigation of the within-person self-efficacy domain: Is self-efficacy a product of past performance or a driver of

- future performance? *Personnel Psychology*, 66(3), 531-568. <https://doi.org/10.1111/peps.12035>
- Simmonds, M., Llewellyn, A., Owen, C. G., & Woolacott, N. (2015). Predicting adult obesity from childhood obesity: A systematic review and meta-analysis. *Obesity Reviews*, 17(2), 95-107. <https://doi.org/10.1111/obr.12334>
- Singer, E., & Bossarte, R. M. (2006). Incentives for survey participation. *American Journal of Preventive Medicine*, 31(5), 411-418. <https://doi.org/10.1016/j.amepre.2006.07.013>
- Smith, B. M., Villatte, J. L., Ong, C. W., Butcher, G. M., Twohig, M. P., Levin, M. E., & Hayes, S. C. (2018). The influence of a personal values intervention on cold pressor-induced distress tolerance. *Behavior Modification*, 43(5), 688-710. <https://doi.org/10.1177/0145445518782402>
- Smith, K. E., & Juarascio, A. (2019). From ecological momentary assessment (EMA) to ecological momentary intervention (EMI): Past and future directions for ambulatory assessment and interventions in eating disorders. *Current Psychiatry Reports*, 21(7). <https://doi.org/10.1007/s11920-019-1046-8>
- Smout, M., Davies, M., Burns, N., & Christie, A. (2014). Development of the valuing questionnaire (VQ). *Journal of Contextual Behavioral Science*, 3(3), 164-172. <https://doi.org/10.1016/j.jcbs.2014.06.001>
- Sobell, L. C., Agrawal, S., Sobell, M. B., Leo, G. I., Young, L. J., Cunningham, J. A., & Simco, E. R. (2003). Comparison of a quick drinking screen with the timeline followback for individuals with alcohol problems. *Journal of Studies on Alcohol*, 64(6), 858-861. <https://doi.org/10.15288/jsa.2003.64.858>

- Spidel, A., Lecomte, T., Kealy, D., & Daigneault, I. (2017). Acceptance and commitment therapy for psychosis and trauma: Improvement in psychiatric symptoms, emotion regulation, and treatment compliance following a brief group intervention. *Psychology and Psychotherapy: Theory, Research and Practice, 91*(2), 248-261. <https://doi.org/10.1111/papt.12159>
- Stackpool, C. M. (2013). *Evaluation of a Consumer Fitness-Tracking Device to Assess Sleep in Adults* [Unpublished master's thesis]. University of Wisconsin-La Crosse.
- Staines, G. L. (2008). The causal generalization paradox: The case of treatment outcome research. *Review of General Psychology, 12*(3), 236-252. <https://doi.org/10.1037/1089-2680.12.3.236>
- Stapleton, A., O'Connor, M., Feerick, E., Kerr, J., & McHugh, L. (2020). Testing the relationship between health values consistent living and health-related behavior. *Journal of Contextual Behavioral Science, 17*, 17-22. <https://doi.org/10.1016/j.jcbs.2020.05.002>
- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. *Advances in Experimental Social Psychology, 261*-302. [https://doi.org/10.1016/s0065-2601\(08\)60229-4](https://doi.org/10.1016/s0065-2601(08)60229-4)
- Steene-Johannessen, J., Anderson, S. A., van der Ploeg, H. P., Hendrikson, I. J., Donnelly, A. E., Brage, S., & Ekelund, U. (2016). Are self-report measures able to define individuals as physically active or inactive? *Medicine & Science in Sports & Exercise, 48*(2), 235-244. <https://doi.org/10.1249/mss.0000000000000760>

- Swift, J. K., & Greenberg, R. P. (2012). Premature discontinuation in adult psychotherapy: A meta-analysis. *Journal of Consulting and Clinical Psychology, 80*(4), 547-559. <https://doi.org/10.1037/a0028226>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's Alpha. *International Journal of Medical Education, 2*, 53-55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*(1), 78. <https://doi.org/10.1186/1479-5868-9-78>
- Thekiso, T. B., Murphy, P., Milnes, J., Lambe, K., Curtin, A., & Farren, C. K. (2015). Acceptance and commitment therapy in the treatment of alcohol use disorder and comorbid affective disorder: A pilot matched control trial. *Behavior Therapy, 46*(6), 717-728. <https://doi.org/10.1016/j.beth.2015.05.005>
- Ti, L., & Ti, L. (2015). Leaving the hospital against medical advice among people who use illicit drugs: A systematic review. *American Journal of Public Health, 105*(12), 2587-2587. <https://doi.org/10.2105/ajph.2015.302885a>
- Tomczak, M., & Tomczak, E. (2014). The need to report effect size estimates revisited. An overview of some recommended measures of effect size. *Trends in Sports Sciences, 1*(21), 19-25. <https://9lib.org/document/6qmek7z8-report-effect-estimates-revisited->
- Törneke, N., Luciano, C., & Salas, S. V. (2008). Rule-Governed Behavior and Psychological Problems. *International Journal of Psychology and Psychological Therapy, 8*(2), 141-156.

- Tuncalp, S., & Sheth, J. (1975). Prediction of Attitudes: a Comparative Study of the Rosenberg, Fishbein and Sheth Models". *Advances in Consumer Research*, 2, 389-404. <https://www.acrwebsite.org/volumes/5674/volumes/v02/NA-02>
- Turner, A. D., Smith, C. E., & Ong, J. C. (2017). Is purpose in life associated with less sleep disturbance in older adults? *Sleep Science and Practice*, 1(1). <https://doi.org/10.1186/s41606-017-0015-6>
- United States Department of Agriculture. (2020, December). *Dietary Guidelines for Americans 2020-2025*. Dietaryguidelines.gov. https://www.dietaryguidelines.gov/sites/default/files/2021-03/Dietary_Guidelines_for_Americans-2020-2025.pdf
- U.S. Department of Education. (2017, February). *A Profile of the Enrollment Patterns and Demographic Characteristics of Undergraduates at For-Profit Institutions*. National Center for Education Statistics (NCES), a part of the U.S. Department of Education. <https://nces.ed.gov/pubs2017/2017416.pdf>
- USDA Food and Nutrition Service (2020, July 21). *Healthy eating index (HEI)*. <https://www.fns.usda.gov/healthy-eating-index-hei>
- University of Minnesota. (2015). *Health and Health Related Behaviors: University of Minnesota Twin Cities Students*. Boynton Health. https://boynton.umn.edu/sites/boynton.umn.edu/files/2017-09/UofMTwinCities_CSHSReport_2015.pdf
- Vallis, M., Ruggiero, L., Greene, G., Jones, H., Zinman, B., Rossi, S., Edwards, L., Rossi, J. S., & Prochaska, J. O. (2003). Stages of change for healthy eating in

diabetes. *Diabetes Care*, 26(5), 1468-

1474. <https://doi.org/10.2337/diacare.26.5.1468>

van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing*, 25(4), 40-48.

van der Zee, M. D., van der Mee, D., Bartels, M., & de Geus, E. J. (2019). Tracking of voluntary exercise behaviour over the lifespan. *International Journal of Behavioral Nutrition and Physical Activity*, 16(17). <https://doi.org/10.1186/s12966-019-0779-4>

Vasiliou, V. S., Karademas, E. C., Christou, Y., Papacostas, S., & Karekla, M. (2021). Acceptance and commitment therapy for primary headache sufferers: A randomized controlled trial of efficacy. *The Journal of Pain*, 22(2), 143-160. <https://doi.org/10.1016/j.jpain.2020.06.00>

Viswanathan, M., Golin, C. E., Jones, C. D., Ashok, M., Blalock, S. J., Wines, R. C., Coker-Schwimmer, E. J., Rosen, D. L., Sista, P., & Lohr, K. N. (2012). Interventions to improve adherence to self-administered medications for chronic diseases in the United States. *Annals of Internal Medicine*, 157(11), 785. <https://doi.org/10.7326/0003-4819-157-11-201212040-00538>

Voorheis, P., Zhao, A., Kuluski, K., Pham, Q., Scott, T., Sztur, P., Khanna, N., Ibrahim, M., & Petch, J. (2022). Integrating behavioral science and design thinking to develop mobile health interventions: Systematic scoping review (Preprint). <https://doi.org/10.2196/preprints.35799>

- Vowles, K., & McCracken, L. (2008). A prospective analysis of acceptance of pain and values-based action in chronic pain sufferers. *The Journal of Pain, 9*(4), 52.
<https://doi.org/10.1016/j.jpain.2008.01.228>
- Vowles, K. E., Sowden, G., Hickman, J., & Ashworth, J. (2019). An analysis of within-treatment change trajectories in valued activity in relation to treatment outcomes following interdisciplinary acceptance and commitment therapy for adults with chronic pain. *Behaviour Research and Therapy, 115*, 46 – 54
<https://doi.org/10.1016/j.brat.2018.10.012>
- Wada, T., Matsumoto, H., & Hagino, H. (2019). Customized exercise programs implemented by physical therapists improve exercise-related self-efficacy and promote behavioral changes in elderly individuals without regular exercise: A randomized controlled trial. *BMC Public Health, 19*(1). <https://doi.org/10.1186/s12889-019-7270-7>
- Wallin, E., Parling, T., Weineland, S., & Dahl, J. (2018). Acceptance and commitment therapy to promote value attainment among individuals with overweight: A multiple baseline evaluation. *Journal of Contextual Behavioral Science, 10*, 41-49. <https://doi.org/10.1016/j.jcbs.2018.08.007>
- Warziski, M. T., Sereika, S. M., Styn, M. A., Music, E., & Burke, L. E. (2007). Changes in self-efficacy and dietary adherence: The impact on weight loss in the PREFER study. *Journal of Behavioral Medicine, 31*(1), 81-92. <https://doi.org/10.1007/s10865-007-9135-2>

- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, 132(2), 249-268. <https://doi.org/10.1037/0033-2909.132.2.249>
- Weitzel, J. A., Bernhardt, J. M., Usdan, S., Mays, D., & Glanz, K. (2007). Using wireless handheld computers and tailored text messaging to reduce negative consequences of drinking alcohol. *Journal of Studies on Alcohol and Drugs*, 68(4), 534-537.
- Wersebe, H., Lieb, R., Meyer, A. H., Hoyer, J., Wittchen, H., & Gloster, A. T. (2017). Changes of valued behaviors and functioning during an acceptance and commitment therapy intervention. *Journal of Contextual Behavioral Science*, 6(1), 63-70. <https://doi.org/10.1016/j.jcbs.2016.11.005>
- Whelan, R., & Barnes-Holmes, D. (2004). The transformation of consequential functions in accordance with the relational frames of same and opposite. *Journal of the Experimental Analysis of Behavior*, 82(2), 177-195. <https://doi.org/10.1901/jeab.2004.82-177>
- Williams, D. M., & Rhodes, R. E. (2014). The confounded self-efficacy construct: Conceptual analysis and recommendations for future research. *Health Psychology Review*, 10(2), 113-128. <https://doi.org/10.1080/17437199.2014.941998>
- Wilson, K. G., & DuFrene, T. (2009). *Mindfulness for two: An acceptance and commitment therapy approach to mindfulness in psychotherapy*. New Harbinger Publications.
- Wilson, K. G., & Murrell, A. R. (2004). Values Work in Acceptance and Commitment Therapy: Setting a Course for Behavioral Treatment. In S. C. Hayes, V. M.

- Follette, & M. M. Linehan (Eds.), *Mindfulness and acceptance: Expanding the cognitive-behavioral tradition* (pp. 120–151). Guilford Press.
- Wilson, P. M., Rodgers, W. M., Fraser, S. N., & Murray, T. C. (2004). Relationships between exercise regulations and motivational consequences in University students. *Research Quarterly for Exercise and Sport*, 75(1), 81-91.
<https://doi.org/10.1080/02701367.2004.10609136>
- Wilson, K., & Sandoz, E. (2010). Mindfulness, values, and the therapeutic relationship in Acceptance and Commitment Therapy. In S. Hick & T. Bein (Eds.), *Mindfulness and the therapeutic relationship*. Guilford press.
- Wilson, K. G., Sandoz, E. K., Kitchens, J., & Roberts, M. (2010). The valued living questionnaire: Defining and measuring valued action within a behavioral framework. *The Psychological Record*, 60(2), 249-272. <https://doi.org/10.1007/bf03395706>
- World Health Organization (2020, November 26). *Physical activity*.
<https://www.who.int/news-room/fact-sheets/detail/physical-activity>
- Wright, C. J., Dietze, P. M., Crockett, B., & Lim, M. S. (2016). Participatory development of MIDY (Mobile intervention for drinking in young people). *BMC Public Health*, 16(1). <https://doi.org/10.1186/s12889-016-2876-5>
- Wright, B. J., O'Halloran, P. D., & Stukas, A. A. (2015). Enhancing self-efficacy and performance: An experimental comparison of psychological techniques. *Research Quarterly for Exercise and Sport*, 87(1), 36-46. <https://doi.org/10.1080/02701367.2015.1093072>

- Xu, X., Tupy, S., Robertson, S., Miller, A., Correll, D., Tivis, R., & Nigg, C. R. (2018). Successful adherence and retention to daily monitoring of physical activity: Lessons learned. *PLOS ONE*, *13*(9), e0199838. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0199838>
- Yildiz, E. (2020). The effects of acceptance and commitment therapy on lifestyle and behavioral changes: A systematic review of randomized controlled trials. *Perspectives in Psychiatric Care*. <https://doi.org/10.1111/ppc.12482>
- Zakiei, A., Khazaie, H., Rostampour, M., Lemola, S., Esmaeili, M., Dürsteler, K., Brühl, A., Sadeghi-Bahmani, D., & Brand, S. (2021). Acceptance and commitment therapy (ACT) improves sleep quality, experiential avoidance, and emotion regulation in individuals with insomnia—Results from a randomized interventional study. *Life*, *11*(2), 133. <https://doi.org/10.3390/life11020133>
- Zettle, R. D., & Hayes, S. C. (1982). Rule-governed behavior: A potential theoretical framework for cognitive-behavioral therapy. *Advances in Cognitive-Behavioral Research and Therapy*, 73-118. <https://doi.org/10.1016/b978-0-12-010601-1.50008-5>
- Zettle, R. D., Hayes, S. C., Barnes-Holmes, D., & Biglan, A. (2015). *The Wiley handbook of contextual behavioral science*. John Wiley & Sons.

Appendices

Appendix A: Institutional Review Board Approval Letter



Institutional Review Board

328 Wells Hall
Murray, KY 42071-3318
270-809-2916 • msu.irb@murraystate.edu

TO: Michael Bordieri, Psychology

FROM: Jonathan Baskin, IRB Coordinator *JB*

DATE: 9/24/2021

RE: Human Subjects Protocol I.D. – IRB # 22-030

The IRB has completed its review of your student's Level 1 protocol entitled *Health in University Students*. After review and consideration, the IRB has determined that the research, as described in the protocol form, will be conducted in compliance with Murray State University guidelines for the protection of human participants.

The forms and materials that have been approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB Procedures and Guidelines section 20.3.

Your stated data collection period is from 9/24/2021 to 9/23/2022.

If data collection extends beyond this period, please submit an Amendment to an Approved Protocol form detailing the new data collection period and the reason for the change.

This Level 1 approval is valid until 9/23/2022.

If data collection and analysis extends beyond this date, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 9/23/2022. You must reapply for IRB approval by submitting a Project Update and Closure form (available at murraystate.edu/irb). You must allow ample time for IRB processing and decision prior to your expiration date, or your research must stop until such time that IRB approval is received. If the research project is completed by the end of the approval period, then a Project Update and Closure form must be submitted for IRB review so that your protocol may be closed. It is your responsibility to submit the appropriate paperwork in a timely manner.

The protocol is approved. You may begin data collection now.

**Opportunity
afforded**

murraystate.edu

Appendix B: Values Intervention Script & Statement Construction

Audio recording script

Today you're going to listen to a short audio recording on health and values. Take a moment to settle into your chair and perhaps close your eyes as you consider some of the following questions.

Deep down inside, what is important to you? What do you want your life to stand for?

What sort of qualities do you want to cultivate as a person? How do you want to be in your relationship with yourself, your body, and your health? Values are our wants for the way we want to interact with and relate to the world, other people, and ourselves. They are leading principles that can guide us and motivate us as we move through life.

Values are not the same as goals. Values are directions we keep moving in, whereas goals are what we want to achieve along the way. A value is like heading North; a goal is like the river or mountain or valley we aim to cross whilst traveling in that direction. Goals can be achieved or 'crossed off', whereas values are an ongoing process. For example, if you want to invest in your fitness and challenge yourself, that is a value - an ongoing process. If you stop investing your time and energy into your fitness or stop challenging yourself during your workouts, then you are no longer investing in your fitness and challenging yourself. In contrast, if you want to run a 5k with your friend, that's a goal - it can be crossed off or achieved. Once you've completed it, you're done - even if you stop challenging yourself or investing in your fitness. If you want to lose 5 pounds before you go to the beach, that's a goal. Once you've got it, goal achieved. But if you want to give your body the nutrition it needs, that's a value - an ongoing process.

Close your eyes for a moment and picture a time in the last month when you felt like you were really living in a way that personally connected with health for you. What were you doing? What characteristics were you exhibiting? What does this picture tell you about what matters to you in regard to your health? Does this memory tell you anything about how you'd like to behave in the future?

In a moment I will share with you areas of health that are valued by some people. Not everyone has the same values, and this is not a test to see whether you have the "correct" values. Think about each area in terms of general life directions, rather than in terms of specific goals. There may be certain motivations that you don't really connect with.

There may be values that overlap for you concerning health – for example, I value fitness, fun, and building social relationships, and all of these lead me to hike with my friends. It is also important that you think of what you would value if there were nothing in your way. What's important? What do you care about? And what would you like to work towards?

List

Restoration, stamina, exertion, longevity, striving, sporting, transformation, immunity, physicality, alertness, fertility, movement, beauty, discipline, fitness, leisure, stimulation, functioning, nutrition, responsibility, ability, strength, challenge, perseverance, empowerment, self-control, energy, peacefulness, wellness, resilience, balance, intimacy, accomplishment, self-care, fun, connection, confidence, freedom, independence, personal growth

Textual Prompt

“What are your values related to maintaining your physical well-being? How do you want to look after your health, with regard to sleep, diet, exercise, smoking, alcohol, etc.?

Please list your own personal reasons for looking after your health. Be specific.”

Appendix C: Informational Control Intervention Script

Audio recording script:

College students in the United States face unique health risks. We may not get in enough exercise, sit for long periods of time doing schoolwork; may be tired; We might be feeling bad or gaining weight from drinking too much or not having the best diet. Staying healthy in college can be hard, but there's a lot of information out there to help us.

First, why is it important to talk about all of this? Research shows that we can get a lot of benefits - and prevent a lot of harm - by taking care of our bodies. For example, physical activity and sleep have both been linked to your mood - exercise can lessen symptoms of depression anxiety and stress, and getting insufficient sleep can make us feel irritable. Sleep is also especially important in school - not getting enough can make it hard to focus when we're studying, maybe impacting grades or how much time we have to spend doing schoolwork. Nicotine can keep us awake and produce irritability and trouble concentrating, too.

Now that we have talked about how caring for your health can be worthwhile, here are some tips to help you figure out what kind of behaviors and choices will help you stay healthy. The World Health Organization recommends that adults do some kind of strength training twice a week, 2.5 to 5 hours of aerobic activity a week, and try to reduce time sitting. They support policies like those we have at MSU that you can take advantage of, like our free gym and a campus design that makes walking for transportation safe.

The National Institutes of Health says that adults need 7 to 8 hours of sleep a night to function well and avoid mood problems. They stress that we need this every night if possible, because we can't "make up" sleep by sleeping longer on another day. If you have trouble getting good quality sleep, it can be helpful to get in vigorous exercise, caffeine, and bigger meals early in the day. After activities like homework, scrolling on the phone, and tv, taking time before bed to relax can help you get to sleep. Even a few drinks can interrupt sleep, so take time between drinking and bed to feel your best. Nicotine can also interrupt sleep, and causes several diseases.

In fact, the Center for Disease Control and Prevention defines drinking 4-5 drinks in a couple hours as binge drinking, which leads to health problems. They recommend having 1 or 2 drinks at a time.

Food choices can impact health as well. The USDA says healthy eating looks like making sure you're getting protein at every meal and making half your plate vegetables and fruit. You don't have to avoid junk food, just make sure most of your diet consists of food with nutrients. Tips for avoiding lots sugar are: limiting how many alcoholic drinks you have at once, choosing "no added sugar" packaged foods, and replacing soda and sports drinks with sugarless drinks. This can seem hard on a college budget, but one university recommends keeping healthy snacks in your dorm room and eating breakfast daily.

Appendix D: Informational Control Texts

1. “Relax before bed. Don’t overschedule your day so that no time is left for unwinding. A relaxing activity, such as reading or listening to music, should be part of your bedtime ritual.” – National Institutes of Health
2. “The World Health Organization says sports and recreation facilities like the free MSU gym provide opportunities for everyone to access and participate in a variety of different sports, dance, exercise and active recreation.”
3. “Drink water instead of buying sodas or other sugary drinks. Water is easy on your wallet and has zero calories. A reusable water bottle is a great way to have water with you on the go.” – myplate.gov
4. When choosing to quit smoking or vaping, the American Cancer Society recommends “Tell your friends about your plans to quit... talk with them about what you need – for instance, patience as you go through cravings, taking your late-night or early-morning phone calls, and plans for doing things in places where it’s harder to use tobacco.”
5. The CDC recommends talking with your healthcare provider about your drinking behavior and requesting counseling if you drink too much.
6. “Don’t take naps after 3 p.m. Naps can help make up for lost sleep, but late afternoon naps can make it harder to fall asleep at night.” – National Institutes of Health
7. “Look for opportunities to reduce sedentary time and to increase active time. For example, instead of watching TV, take a walk after dinner.” – CDC

8. “Choose packaged foods that have less or no added sugars, such as canned fruit packed in 100% juice for an easy snack, plain yogurt (you can add your own fruit), and unsweetened applesauce”
 9. “Many studies have shown using nicotine replacement therapy can nearly double the chances of quitting smoking.” – American Cancer Society
- “Drink in moderation by limiting intake to 2 drinks or less in a day for men and 1 drink or less in a day for women, when alcohol is consumed. Drinking less is better for health than drinking more.” – CDC