Running Head: COGNITIVE FRAMING AND DIFFERENCES IN HEALTH BEHAVIOR

Health and Cognitive Framing

Individual and Group Differences in Health Behaviors

by

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Abstract

Attitudes are often considered to be one of the most important theoretical constructs in determining behavior. However, there are often discrepancies between individuals' attitudes about health and their actual health behaviors. This study sought to examine this incongruence by investigating the degree and types of differences that exist between people's health behaviors and attitudinal correlates. Attitudes were assessed through a Health Behavior Implicit Association Test and an object-ratings task, while behaviors were investigated through a demographic and health status survey. Analyses of these measures revealed a general implicit bias towards healthy compared to unhealthy behaviors across all participants. However, differences in attitudes towards health behaviors were found between groups, specifically high and low health groups on ratings of affect. High health groups had more positive associations with healthy behaviors and low health groups had greater positive associations with unhealthy behaviors. These associations appeared to influence engagement with said behaviors, suggesting that certain dimensions of attitudes do play a role in predicting later action. The results from this study should be taken into consideration by the medical community to determine more effective ways of developing health intervention programs that produce long-lasting positive health behavioral change.

*Keywords*: health, health behaviors, health groups, attitudes, IAT

Health and Cognitive Framing: Individual and Group Differences in Health Behaviors

In today's society health is considered to be something of great value, so it is not surprising that people are becoming increasingly conscious about their well-being (Sarafino, 2006). Despite mounting public health information, the leading causes of death and health problems in developed countries are chronic diseases, such as cardiovascular disease, cancer, stroke, and diabetes (Sarafino, 2006). 48 million people in the United States continue to smoke, the majority of adults do not participate in regular physical activity, and 65% of American adults are either overweight or obese (Cordain et al., 2005; Sarafino, 2006). If people are aware that behaviors such as, smoking, eating an unbalanced diet, leading a sedentary lifestyle, and drinking alcohol are detrimental to one's health, why do people continue to partake in such behaviors? Previous research has focused on attitudes regarding particular behaviors such as smoking, dieting, and exercise in attempt to develop specific intervention methods, but little work has been done on a more general level. Accordingly, this research aims to address larger individual and group differences in attitudes and behaviors with respect to overall health.

*Health* is commonly defined as a state of physical, mental, and social well-being. However, health can mean different things to different people depending on one's age, race or gender. Nevertheless, health has been implicated as a factor used by many to organize health-related beliefs and intentions that may determine individual health behaviors (Pisarek, Guszkowska, Zagórska, & Lenartowicz, 2011). *Health behaviors* are activities performed to maintain or improve one's health and can be defined as, "Overt behavior patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement" (Gochman, 1988, p. 3). Exercising, eating a balanced diet and getting a vaccination are all examples of health behaviors.

Most research on health behavior has utilized cognitive approaches, which emphasize how beliefs, expectations, values, and attitudes allow people to interpret, understand and predict events (Gochman, 1988). Findings from general cognitive research suggest that there is an association between attitudes and behaviors, that is, attitudes predict behaviors (Ajzen & Fishbein, 1977). It has been determined that there are two different modes by which attitudes influence behavior: explicitly and implicitly (Fazio, 1990). Explicit attitudes guide one's behaviors through conscious analyses of the pros and cons of a certain actions. Conversely, implicit attitudes instinctively guide behavior without a conscious consideration of the resulting costs or benefits (Fazio, 1990). These implicit attitudes often manifest themselves as actions or judgments without the individual's awareness of the causation (Greenwald, McGhee, & Schwartz, 1998).

Research has demonstrated that most individuals have positive implicit and explicit associations with health. For example, health studies have revealed that adults with obesity and controls both demonstrate negative implicit attitudes towards high-fat food, and that the obese individuals had significantly stronger implicit negative attitudes towards high-fat foods (Roefs & Jansen, 2002). Similarly, obese children and controls demonstrate positive explicit attitudes towards physical activity and negative explicit attitudes towards unhealthy food (Craeynest et al., 2005). Implicitly, obese children do not display more positive implicit attitudes toward sedentary lifestyles compared to lean controls, contrary to what one might expect (Craeynest et al., 2005). Furthermore, obese children do not have a more pronounced negative implicit attitude towards physical activity and do not display more positive implicit attitudes towards unhealthy food compared to healthy food (Craeynest et al., 2005).

Despite much evidence from previously conducted research suggesting that attitudes are one of the most important theoretical constructs in determining behavior and that even unhealthy people have relatively positive associations with health, there is often much discrepancy between people's attitudes and their resulting health behaviors. The stance that attitudes are accurate predictors of health behavior is not as strong as former research suggests (Stacy, Bentler, & Flay, 1994). Measures that assess explicit attitudes regarding health are not usually good predictors of behavior because people frequently do not behave in accordance with their attitudes (Schwarzer, 2008). For example, attitudes towards behaviors such as drunk driving, binge eating and smoking have not been found to predict later involvement with said activities, suggesting that attitudes are neither consistent nor strong predictors of health behaviors (Stacy et al., 1994).

We believe that attitudes may not perfectly explain behavior because groups of people can have overall positive associations, but the strength of those associations likely still differs significantly across people. If we could associate the degree to which each individual held a positive association with health concepts with their actual health behavior, the evidence between attitudes and behavior may be strengthened. We hypothesized that all people have positive attitudes towards healthy behaviors; however, different qualitative associations concerning certain behaviors that are considered healthy and unhealthy exist between individuals and groups. Additionally, we predict that healthy behaviors are covalent; someone who values one type of healthy behavior will also value other types of healthy behaviors by proxy. In contrast, unhealthy behaviors are likely independent; someone who values one type of unhealthy behavior will not necessarily value other types of unhealthy behaviors. Accordingly, healthy people's explicit attitudes towards health behaviors should correlate more than non-healthy individuals.

In order to determine how attitudes interact to regulate health behaviors, we assessed participants' implicit attitudes concerning general health behaviors, explicit attitudes regarding the healthiness and enjoyableness of various behaviors, and current engagement in health behaviors. To assess implicit attitudes toward health behaviors we created a novel version of the Implicit Association Test (IAT; Greenwald et al., 1998) called the Health Behavior Implicit Association Test (HB-IAT). Explicit attitudes toward health behaviors were ascertained through an object-ratings task, in which participants rated the healthiness and enjoyableness of 115 behaviors and experiences that were preselected to cover all four cells in the healthy by enjoyable matrix. Additionally, they were asked to rate how often they engaged in each behavior, how much more or less they wished that they engaged in each behavior, and how much they consider each behavior part of a well-lived life. Participants also completed a demographic and health status survey. Quantitative and qualitative analyses of these responses were used to define the degree and types of differences in people's health behaviors and their attitudinal correlates.

Differences in attitudes between groups and individuals may be a contributing factor in behavior-intent discrepancies regarding health behaviors. By collecting data on people's attitudes, both implicit and explicit, towards various healthy and enjoyable activities, in addition to demographic and health information, we hope to uncover the varying components of attitudes and how these components may differ between groups and individuals in dictating health behaviors. These factors may shed light upon why it is so difficult to change people's unhealthy behaviors and, or help maximize the effectiveness of health campaigns and intervention programs. We hope that this research will lead to the development of more successful ways to tailor health messages leading to permanent changes in health behaviors in all types of people, even those who do not currently value such behaviors.

**Method**

**Participants**

Study participants were 39 undergraduate students (18 males and 21 females) enrolled in introductory psychology at the University of Michigan, Ann Arbor. The average age of participants was 18.97 years (SD=1.06), ranging from 18 to 22 years old. The majority were Caucasian (67%), with 21% Asian, 5% American Indian, 5% African American, and 3% bi-racial.

Participants received one hour of credit towards their Introductory Psychology Subject Pool course requirement in exchange for their voluntary participation. Prior to beginning the experiment all subjects signed an informed consent document and all procedures were approved by the Institutional Review Board of the University of Michigan.

**Measures**

**HB-IAT.** The IAT is a commonly used procedure to assess implicit attitudes (Greenwald et al., 1998). The test measures implicit mental processes by comparing response speeds in a double-categorization task combing a concept classification (e.g., boy versus girl) and an attribute classification (e.g., good versus bad) (Cvencek, Greenwald, & Meltzoff, 2011). Reaction time (RT) is understood to be an indirect measure of the individual's degree of association between the two concepts, and the degree of implicit association is interpreted as an indicator of a person's unconscious or implicit attitude (Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). People with, for example, pre-existing implicit associations with boy and good would likely be faster to classify boy and good when these concepts and attributes are mapped onto the same response key, compared to when boy and bad are mapped onto the same response key. Unlike other cognitive priming methods, that IAT likely supersedes self-

presentation strategies, meaning that the test reveals people's attitudes and automatic associations that they may not openly express (Greenwald et al., 1998).

Accordingly, the HB-IAT was used to assess implicit attitudes toward healthy and unhealthy behaviors. The HB-IAT used 32 stimuli: eight images of healthy behaviors, eight images of unhealthy behaviors, eight positive words, and eight negative words. The positive and negative words were selected from the Project Implicit® Race IAT (IAT Corp.). The current authors selected the chosen images of healthy and unhealthy behaviors as exemplars of healthy and unhealthy activities (see *Appendix A* for a complete list).  The HB-IAT was programmed and administered with E-Prime Version 2.0 (Psychology Software Tools, Inc., Pittsburgh, PA).

**Object-ratings task.** An online object-ratings task was created through a custom-built web interface to determine individual and group differences in explicit attitudes regarding 115 activities of varying levels of health and pleasantness in a 2x2 design, including equal numbers of healthy/enjoyable, healthy/unenjoyable, unhealthy/enjoyable, and unhealthy/unenjoyable behaviors as classified by the authors. These classifications were used throughout the experiment and during later analysis.

**Demographic survey.** After the object-rating task all participants completed an online demographic and health survey to gather information concerning the participants' current demographic and health information..  The survey consisted of 24 questions, which assessed demographic information and the current health status of the participants.

**Procedure**

Participants were tested in a psychology research lab at the University of Michigan, where they each completed the HB-IAT, object-ratings task and demographic survey sequentially on a Dell desktop PC.  Prior to beginning the experiment, participants were told

about the general purpose of the study and were asked to provide written informed consent. They were then given information about the HB-IAT procedure, in which they would be classifying pictures of healthy and unhealthy behaviors and words with good or bad connotations into their respective categories.  They were directed to work as quickly and as accurately as possible. Explicit instructions and example trials were provided within the task, before each block.

During the compatible blocks, participants were instructed to press the "q" key on the computer keyboard with their left forefinger if the stimulus was a healthy behavior image or if the stimulus was a good word. In the incompatible blocks, participants paired healthy pictures with bad words and unhealthy pictures with good words. They were instructed to press the "p" key with their right forefinger on the computer keyboard if the stimulus was an unhealthy behavior image or if the stimulus was a bad word. Then the categories were reversed so that the "q" key was for healthy and bad stimuli, and the "p" key was for unhealthy and good stimuli. If participants made a mistake during categorization, an error message appeared in the center of the screen, but participants were instructed to continue the task without correcting the error.

After completing the HB-IAT the participants were told to complete the object-ratings task. Directions for the tasks appeared on the computer screen before the task began, instructing participants to provide responses to statements about 115 activities and objects, for example eight glasses of water a day, a candy bar, a flu shot, and second-hand smoke (see *Appendix B* for a complete list). For each object, participants were asked to respond to five statements on a 9-point Likert scale from -4 (strongly disagree) to 4 (strongly agree) with 0 in the middle. The given statements were as follows: It is extremely healthy; It is extremely enjoyable; It is part of a well-lived life; I engage in this behavior; and I am interested in changing this behavior. Participants were reminded that their responses were confidential and that they were able to skip

questions they felt uncomfortable answering. The order of the object presentation varied across participants, however the statements appeared in the same order for all object-rating trials. As a validity check, two questions instructed participants to check strongly agree or strongly disagree for all five statements to ensure that participants were reading and accurately responding to each question.

The demographic and health status survey immediately followed the object-rating task. After finishing the three tasks, the participants were given a debriefing form describing the intent, hypotheses, predictions, and importance of the study, were thanked for their participation and were subsequently awarded their psychology course credit.

**Analysis**

Prior to conducting statistical analyses, participants were placed into healthy and unhealthy groups based on their responses to the health and demographic questionnaire. These groupings were later used as dependent variables to investigate inter-group differences in attitudes and behaviors. Alpha was set at .05 for all statistical analyses.

**Participant grouping.** Participants were placed into groups according to Body Mass Index (BMI), self-reported levels of health, number of times exercising per week, diet, alcohol dependence, smoking, and overall health.

Participants' BMIs were determined using the conversion formula and categories provided by the National Institute of Health (NIH). Participants had a mean body mass index (BMI) of 23.09 (SD=2.45). 2% of the participants were underweight (BMI <18.5), 72% were normal weight (BMI = 18.5 – 24.9), 26% were overweight (BMI = 25-29.9), and none were obese (BMI > 30).

Participants were asked to rate their current level of health on a 5-point scale from poor to excellent, and were placed into groups consisting of high and low health status groups. Participants who rated their health as excellent or very good were placed in the high health status group (59%), and those who rated their health as good, fair or poor were in the low health status group (41%).

Participants were place into groups of high and low exercisers according to the number of times they exercised per week. The low exercise group consisted of participants who reported exercising 0-3 times per week (33%). The high exercise group was made up of participants who reported exercising 4-7 times per week (66%).

Groups of healthy and unhealthy eaters were created based on participants' responses to six questions about current measures they take to maintain a healthy, well-balanced diet (e.g., rarely consuming red or high fat meats, pursuing a low-fat diet, eating at least five servings of fruit/vegetables per day, eating a full breakfast, eating high-fiber foods, and rarely consuming sugar or dessert). *Yes* responses were coded 1 and *no* responses were coded 0. Those with a composite score of 2 or less were placed in the unhealthy eater group (64%). Those with a composite score greater than 2 were place in the healthy group (36%).

Participants responded to all four questions of the CAGE Questionnaire, a commonly used measure used by medical professionals to screen for alcohol dependence or problem drinking (Ewing, 1984). *Yes* responses were coded 1 and *no* responses were coded 0. The low alcohol dependency group consisted of individuals with a composite score of 0 (46%). The high alcohol dependency group was composed of individuals who had a composite score of at least one (56%).

Participants who did not currently smoke were placed in the non-smoker group (95%) and subjects who currently smoked were placed in the smoker group (5%).

The above groups of participants were then placed in larger groups of healthy and unhealthy people. The healthy group consisted of participants who were underweight, normal weight, high health status individuals, high exercisers, healthy eaters, at low risk for alcohol dependency, and non-smokers. The unhealthy group was made up of participants who were overweight, low health status individuals, low exercisers, unhealthy eaters, at high risk for alcohol dependency, and smokers.

<div style="text-align:center">**Results**</div>

**IAT**

Reaction times from each trial within each test block were used to calculate the IAT effect according to the improved IAT scoring algorithm (Greenwald, Nosek, & Banaji, 2003). As defined by Greenwald, McGhee, and Schwartz (1998), the IAT effect is the difference in RT between the compatible blocks (*healthy-good*; *unhealthy-bad*) and incompatible blocks (*healthy-bad*; *unhealthy-good)*. Error trials, defined as trails in which participants made an incorrect pairings between stimuli and category, were excluded from analysis.

Median RTs between compatible and incompatible blocks were examined and revealed faster responses to compatible trials, in which healthy behaviors were paired with good words or unhealthy behaviors were paired with bad words (M=632.04, SD=81.79), compared to incompatible trials, where healthy behaviors were paired with bad words or unhealthy behaviors were paired with good words (M=957.83, SD = 211.39). This difference in RT was found to be significant using a two-tailed paired t-test, $t(38) = 12.27$, $p < .001$, which demonstrated an

implicit association between health and good. This association was not affected by participant gender, t(36) = .76, $p$ = .45.

The IAT effect was calculated for each participant by subtracting participants' median RT from the compatible blocks from their median RT on the incompatible block. Positive effect scores indicate an implicit healthy-good/unhealthy-bad association, which were seen across all participants. Correlations between overall health group and IAT effect revealed no significant differences, r(37) =.281, $p$ = .092, suggesting that there are not considerable differences in attitudes concerning health between groups and that there is a strong implicit bias towards health across all individuals.

**Health and Demographics**

Correlations were computed between all health variables (health status, exercise per week, diet, alcohol dependency, smoking and BMI) to investigate links between healthy and unhealthy behaviors (see Table 2). A significant relationship was found between exercise and diet, r(37) = .38, $p$ = .02, and exercise and health, r(37) = -.62, $p$ < .001, such that those who exercised more frequently also ate healthy and reported better overall health. Additionally, health status significantly correlated with BMI, r(37) = .35, $p$ = .03, denoting that those with lower BMIs reported better health overall.

High health status, diet, exercise and BMI, all indicators of health, each correlated with at least one other health behavior, suggestion that health behaviors are covalent. In contrast, significant correlations were not found between unhealthy behaviors. Smoking and alcohol dependency did not significantly correlate with any other behavior, be it healthy or unhealthy, suggesting that unhealthy behaviors are more independent from one another. That is to say, if

someone values one unhealthy behavior, for example smoking, it does not necessitate that they value or partake in other unhealthy behaviors, such as drinking or eating poorly.

**Object Ratings**

Mean ratings of each variable (healthy, enjoy, well-lived, engage, change) for all 115 objects were computed to ensure that the classification of each behavior as healthy or unhealthy and enjoyable or unenjoyable was accurate (see Table 3). A qualitative analysis of the resulting values demonstrated that participants rated healthy behaviors as more healthy, more enjoyable and part of a well-lived life to a greater extent than unhealthy behaviors. Additionally, participants engaged in healthy behaviors more often than unhealthy behaviors and had a greater desire to do healthy behaviors more frequently than unhealthy behaviors. The mean ratings from all participants of the healthy and unhealthy behaviors were consistent with the expected findings about people's attitudes concerning healthy and unhealthy activities, suggesting that the 115 behaviors we chose were accurate exemplars of healthy and unhealthy behaviors, thus permitting further analysis.

Z-scores were computed for each participant across all object-rating variables. Mean Z-scores for each variable were computed separately for healthy and unhealthy items. The mean Z-scores for healthy and unhealthy behaviors were then correlated with the participant health behavior groups (see Table 4). Tests revealed significant relationships between health status and Z-scores for enjoyableness of unhealthy behaviors, $r(36) = .342$, $p = .036$, such that lower health status individuals think unhealthy behaviors are more enjoyable. Exercise frequency significantly correlated with Z-scores of enjoyableness, $r(36) = .375$, $p = .02$, ratings of well-lived life, $r(36) = .372$, $p = .02$, engagement, $r(36) = .418$, $p = .009$, and desire to change behaviors, $r(36) = .418$, $p = .009$. This suggests that people who exercise more think healthy behaviors are more enjoyable,

more part of a well lived life, engage in them more and want to do them even more. Alcohol consumption significantly correlated with mean Z-score ratings of enjoyableness, r(36) = .381, *p* = .018, a well-lived life, r(36) = .374, *p* = .021, and engagement, r(36)=.474, *p* = .003 for unhealthy behaviors, suggesting that those who are more dependent on alcohol think unhealthy behaviors are more enjoyable, more part of well lived life, and engage in them often. Composite healthy eating scores significantly correlated with mean Z-scores of enjoyableness, r(36) = .357, *p* = .028, and engagement for health behaviors, r(36) = .412, *p* = .01, suggesting that those who eat healthier think that healthy behaviors are more enjoyable and more part of a well lived life. BMI significantly correlated with mean z-score ratings of enjoyableness for unhealthy behaviors, r(36) = .361, *p* = .026, suggesting that those with higher BMIs think unhealthy behaviors are more enjoyable.

These correlations suggest that health status and engagement in healthy behaviors relates to attitudes about health behaviors. Healthy people displayed positive explicit attitudes about healthy behaviors, whereas unhealthy people demonstrated more positive explicit attitudes about unhealthy behavior. These associations suggest a link between attitudes and corresponding behaviors.

## Discussion

This study investigated individual and group differences in attitudes regarding health behaviors. Attitudes concerning certain health behaviors have been explored in the past but, to the best of our knowledge, this is the first study that aimed to investigate differences in attitudes concerning health behaviors on a more general level. We hypothesized that all individuals have a positive implicit bias towards all types of health behaviors, however differences in explicit health

associations concerning certain behaviors exist between healthy and unhealthy groups of individuals. Results from this study provided evidence to support both of our hypotheses.

In the IAT, all participants had faster RTs on compatible blocks compared to incompatible blocks, meaning that they were faster at associating healthy behaviors with good words and unhealthy behaviors with bad words. This association with healthy behaviors and good suggests a positive implicit bias towards health. Correlations were not found between IAT effect and health group, suggesting that all individuals, regardless of overall health status, have a positive association with health. However, differences in the explicit appraisal of health-relevant behaviors between groups were found. High health and low health groups differed in their attitudes concerning the enjoyableness and value in a well-lived life of healthy and unhealthy behaviors.

High health people found healthy behaviors to be, on average, more enjoyable, and more part of a well-lived life compared to low health people. In contrast, individuals in the low health groups found unhealthy behaviors to be more enjoyable, and more part of a well-lived life, compared to high health individuals, in general. These attitudes also appeared to influence whether or not people participated in such behaviors. Healthy people engaged in the listed healthy behaviors more frequently than unhealthy people, and unhealthy people engaged more often in unhealthy behaviors compared to healthy people, even for things that were not included in their classification as high or low health. This connection between attitude and behavior is consistent with findings that suggest attitudes have predictive power over behaviors (Kraus, 1995).

However, our results suggest that it is not general implicit attitudes about health that determine later behavior. The HB-IAT demonstrated that all people posses a positive association

with health. If this general positive association with health predicted behavior, all participants would have revealed the same attitudes towards and frequency of engaging in healthy and unhealthy behaviors. This was not the case. Differences between high and low health groups in ratings of healthiness, enjoyableness, and the features of a well-lived life suggest that attitudes about health have multiple components that differentially predict real-world behavior. These results suggest that attitudes corresponding to the pleasure and subjective value associated with behaviors are most predictive of behavior. This finding is supported by the theory of reasoned action, which states that affect is the most important aspect of an attitude in determining subsequent actions (Azjen & Fisbein, 1980).

The medical community can use results from this study in order to create more effective ways to bring about positive changes in people's health behaviors. Previous investigations have demonstrated that knowledge, alone, is not enough to engender changes in behavior (Petty et al., 2009). Consequently, many researchers have explored the effects of tailoring health messages and interventions. Their data has suggested that tailored messaged are more effective in changing people's behaviors compared to general health messages and, or interventions. Accordingly, tailored messages and health interventions that take into consideration patients' specific problems are more likely to induce and sustain behavioral change compared to untailored messages (Bull et al., 1999). However, these positive changes in health are often ephemeral (Petty et al., 2009).

While tailored health messages take into account individuals' specific problems, they do not also take into consideration the attitudes of these individuals. This may be a reason that people cannot sustain changes in their health behaviors. Specifically, attitudes concerning the level of enjoyableness or value possessed by certain health behaviors should be taken into

account when urging people to perform healthier behaviors. For example, if someone needs to start exercising but does not enjoy running or going to the gym, they will not sustain a gym exercise regimen. By taking into account individual likes and dislikes, medical professionals will be able to develop health regimens tailored to fit people's attitudes. If people have positive attitudes towards these new health behaviors, they will likely continue engaging in such healthy activities, because attitudes have shown to be consistent with behavior (Zanna, Olson, & Fazio, 1981).

Despite having revealed associations between attitudes and health behavior, this study has several limitations. First, the HB-IAT is a novel IAT that has not been used in other studies. As with the use of any IAT, the relationship between the IAT and explicit measures of attitude and behavior should vary as a function of the topic under investigation, the characteristics of the explicit measure, and the characteristics of the implicit measure (Hoffman et al., 2005). Thus, there is a need for replication and extension of this measure in order to further validate these results. Additionally, the study of implicit attitudes remains a largely un-explored within the attitude literature (Craeynest et al., 2004). There are still concerns about whether or not implicit attitudes are to be considered stable and context independent (Craeynest et al., 2004).

The sample consisted of solely undergraduate students at an in-state school within the Midwest. This sample was not representative of the larger United States population, thus limiting the generalizability of our findings. However, the finding of significant results in a small, homogenous sample size validates the need for further investigation. Future testing with a larger and more diverse sample of up to 1000 is desirable because of the high individual variability of responses in the American population. Sample sizes of such magnitude are commonly used for applied individual difference work (Rick, Cryder & Lowenstein, 2008).

Most importantly, the HB-IAT was tested on a relatively healthy population in which only 26% percent of the participants were overweight and none were obese, compared to the national average of 34% and 30% percent, according to the Centers for Disease Control and Prevention, respectively. Thus, the null results on the HB-IAT predicting real world health behavior may reflect a restriction in range of the data in that we were not able to access the sector of the population that is most likely to have lower or negative health associations within the college subject pool. Future research needs to examine the IAT results in a larger, more diverse, and less healthy population to verify a lack of association between implicit health associations and behavior.

In summary, this research provides important information concerning general implicit attitudes towards health, while highlighting the differences that exist between high health and low health groups of individuals. Underlying a general positive association with health exists significant differences between groups, which may demonstrate why there are often discrepancies between people's attitudes and actions with respect to health behaviors. Further investigation of these differences will hopefully lead to more effective intervention campaigns and health programs to beget permanent positive change in the populations' health behaviors.

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Table 1.

*Description of the Healthy Behavior Implicit Association Test (HB-IAT)*

| IAT | Block | Description | Response Labels | Response Key |
|-----|-------|-------------|-----------------|--------------|
| 1 | 1 | | Healthy | p |
| | | | Unhealthy | q |
| | 2 | | Good | p |
| | | | Bad | q |
| | 3 | Compatible | Healthy/Good | p |
| | | | Unhealthy/Bad | q |
| | 4 | | Bad | p |
| | | | Good | q |
| | 5 | Incompatible | Unhealthy/Good | p |
| | | | Healthy/Bad | q |
| 2 | 1 | | Healthy | p |
| | | | Unhealthy | q |
| | 2 | | Good | p |
| | | | Bad | q |
| | 3 | Incompatible | Unhealthy/Good | p |
| | | | Healthy/Bad | q |
| | 4 | | Bad | p |
| | | | Good | q |
| | 5 | Compatible | Healthy/Good | p |
| | | | Unhealthy/Bad | q |

Table 2.

*Pearson Correlation Matrix among Healthy and Unhealthy Behaviors*

|  | Health | Exercise | Diet | Alcohol | Smoke | BMI |
|---|---|---|---|---|---|---|
| Health | 1.00 | -.623*** | -.117 | -.016 | .143 | .348* |
| Exercise |  | 1.00 | .378* | -.021 | -.030 | -.135 |
| Diet |  |  | 1.00 | .052 | .088 | -.032 |
| Alcohol |  |  |  | 1.00 | -.007 | -.088 |
| Smoke |  |  |  |  | 1.00 | .283 |
| BMI |  |  |  |  |  | 1.00 |

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

Table 3.

*Mean scores of healthy, enjoyable, well-lived, engage, change ratings for healthy and unhealthy*

*behaviors across all participants*

| Behavior | Healthy | | Enjoyable | | Well-lived | | Engage | | Change | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD | M | SD |
| Healthy | 2.16 | 1.96 | .44 | 2.43 | 1.07 | 2.07 | -.88 | 2.52 | -1.34 | 1.86 |
| Unhealthy | -2.69 | 1.64 | -.09 | 2.95 | -1.37 | 2.35 | -1.83 | 2.19 | .51 | 1.72 |
| All | -.29 | 3.03 | .18 | 2.72 | -.16 | 2.53 | -1.36 | 2.40 | -.41 | 2.01 |

Table 4.

*Correlations among Mean Z-scores of Healthy and Unhealthy Behaviors and Health Behaviors*

|  |  | Health | Exercise | Alcohol | Diet | BMI |
|---|---|---|---|---|---|---|
| Healthy | Healthy Factor Score | 0.09 | 0.002 | 0.122 | 0.09 | -0.084 |
|  | Enjoyable Factor Score | -0.236 | .375* | 0.084 | .357* | -0.083 |
|  | Well-lived Factor Score | -0.206 | .372* | -0.038 | 0.281 | 0.063 |
|  | Engage Factor Score | -0.228 | .418** | 0.292 | .412* | -0.096 |
|  | Change Factor Score | -0.086 | .334* | -0.157 | 0.206 | 0.259 |
| Unhealthy | Healthy Factor Score | 0.015 | 0.065 | 0.226 | 0.017 | 0.037 |
|  | Enjoyable Factor Score | .342* | -0.202 | .381* | -0.234 | .361* |
|  | Well-lived Factor Score | 0.293 | -0.135 | .374* | 0.026 | 0.22 |
|  | Engage Factor Score | 0.253 | -0.272 | .474** | -0.241 | 0.101 |
|  | Change Factor Score | 0.245 | -0.177 | 0.103 | 0.063 | 0.19 |

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

Appendix A

*Implicit Association Test Categories and Items*

*Healthy*: woman eating an apple, man bench pressing, a group hiking, woman eating a salad, group spinning class, man and woman jogging, man running on a treadmill, woman drinking water

*Unhealthy*: woman eating cake, man eating a hamburger, man eating ice cream, man riding a motorcycle, two men eating pizza, man smoking, woman drinking wine and smoking, woman tanning in tanning bed

*Good*: joy, love, peace, wonderful, pleasure, glorious, laughter, happy

*Bad***:** agony, terrible, horrible, nasty, evil, awful, failure, hurt

*Note*. Healthy and unhealthy items were images

Appendix B

*Behaviors rated in object ratings task*

| | |
|---|---|
| Instant ramen noodles | Removing mildew with a caustic spray |
| Small portion-control plates | Candy |
| Low-fat fresh mozzarella | Movie marathon |
| Prunes | Thoroughly washing your hands |
| Taking a smoke break | Small garden salad without dressing |
| Crossword puzzles | Radiation exposure |
| An indulgent hotel brunch buffet | 20-minute cardio class |
| Lifting weights | A green salad with grilled chicken |
| Candy bar | A big meal at an Italian restaurant |
| Getting a complete physical exam | Crisco |
| Big-wave surfing | 10k run |
| Fried chicken | Fast driving |
| 75 stomach crunches | Commuting in traffic to work |
| French fries | Nachos |
| Pitchers of margaritas Butter eating contest | Getting a flu shot |
| | Pulling an all-nighter for work |
| Pigging out | Social smoking |
| Jell-O shots | Bacon and eggs for breakfast |
| A morning stretch | Taking a dog for a walk |
| Loud rock music | Loud, late-night parties |
| Tofu | Brown rice |

Mozzarella sticks

Flossing your teeth

Natural soap

Hand sanitizer

A night alone playing video games

Avocado

8 glasses of water a day

Ballpark hotdogs

Second-hand smoke

Taking vitamin supplements

Greenhouse gases

Fast food breakfast

90-minute cardio class

Quitting smoking

Wheat germ

Drano

Brownie sundae

Doughnuts

Hot cup of coffee in the morning

Raw vegetable snack

Hiking

Meatless dinner

Yoga

Annual cancer screening

Small glass of red wine

Breakfast at an all-you-can eat pancake

house

Cup of frozen yogurt

Fruit for dessert

All fiber cereal

Exercising an hour a day

Eating ice cream out of the tub

Diet soda

One low-carb beer

Breathing air pollution

Tanning

Whole beans with light vinaigrette

A drink after work with friends

Partying with hard drugs with a few

friends

Flaxseed oil

Protein shakes

9 hours of sleep

Global warming

Two cans of red bull

Swimming laps

Online Scrabble game

Pound cake

Drag racing

Tub of buttered movie popcorn

A dip in the pool

Wheat grass

Spraying chemicals to kill weeds

Riding fast on a motorcycle

Bleach wipes

Whole-grains

Oatmeal for breakfast

Sunburn

Steamed brussels sprouts

20 minute massage

A night of drinking

Having your teeth cleaned

30-minute full stretch before exercising

1-mile jog

Red-eye airline flights

Coal mining

Fried rice

Deep-dish pizza

Smoking pot

A small square of very dark chocolate

Funnel cake

A large German stein of beer

Lounging around all day

Large mocha frapuccino

Applying sunscreen