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TIME PERSPECTIVE AND EXERCISE, OBESITY AND SMOKING: MODERATION OF ASSOCIATIONS BY AGE

LC Guthrie, SC Butler, K Lessl, O Ochi, and MM Ward

Intramural Research Program, National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health, Bethesda, MD

Abstract

Purpose—Time perspective, a psychological construct denoting subjective orientation to either present or future concerns, has been inconsistently associated with healthy behaviors in adults. We hypothesized that associations would be stronger in young adults, who are first developing independent attitudes, than in older adults.

Design—Cross-sectional survey.

Setting—Three cities in the Mid-Atlantic region.

Subjects—790 patrons of barber and beauty shops.

Measures—Zimbardo Time Perspective Inventory future, present-fatalistic, and present-hedonistic subscales, current smoking, days per week of recreational exercise, and height and weight, by self-report.

Analysis—We tested if associations between time perspective and exercise, obesity, and current smoking differed by age group (18–24 years, 25–34 years, and 35 and older) using analysis of variance and logistic regression.

Results—Higher future time perspective scores, indicating greater focus on future events, was associated with more frequent exercise, while higher present-fatalistic time perspective scores, indicating more hopelessness, was associated with less frequent exercise in 18 – 24 year olds, but not in older individuals. Lower future time perspective scores, and higher present-hedonistic time perspective scores, indicating interest in pleasure-seeking, were also associated with obesity only in 18 – 24 year olds. Current smoking was not related to time perspective in any age group.

Conclusion—Time perspective has age-specific associations with exercise and obesity, suggesting stages when time perspective may influence health behavior decision-making.

Keywords

time perspective; exercise; obesity; smoking

Indexing key words

Manuscript format: research; Research purpose: modeling/relationship testing; Study design: non-experimental; Outcome measure: behavioral; Setting: local community; Health focus: fitness/physical activity; Strategy: skill building/behavior change; Target population: adults; Target population circumstances: race/ethnicity, education/income level, geographic location

PURPOSE

Time perspective is a cognitive construct that describes a person's orientation to the importance of the present, past, and future in their life (1,2). In some circumstances or for some people, the subjective perspective of time favors considerations far off in the future. These individuals are interested in investing today for the prospect of future gains. In other circumstances or for other people, the subjective perspective of time favors the present or the past. The thoughts and motivations of these individuals are more focused on recent, immediate or short-term considerations than on more remote future possibilities. Time perspective provides a cognitive framework that is theorized to influence decision-making by influencing how near-term and distant outcomes, and the costs of those decisions, are appraised (3). Some investigators conceive time perspective to be a unidimensional construct, with future-orientation and present-orientation at opposite ends of the same scale. However, others conceive of time perspective as multidimensional, with different time frames motivating considerations in different domains (2,4). As a result of either dispositional influences or experience, some individuals may preferentially or habitually use one time perspective more than others.

Health education and health promotion are distinctly future-oriented disciplines. They have as a central tenet the notion that early adoption and consistent practice of healthy behaviors will help prevent disease, improve future quality of life, and lengthen survival. These future benefits may require short-term trade-offs, such as allocating time to exercise regularly, avoiding fatty foods, and limiting alcohol intake. Given the relevance of considerations of the future to health promotion, time perspective has received attention as a factor that may account for individual differences in health behaviors. Those who are more future-oriented would be predicted to more likely engage in healthy behaviors than those who were less future-oriented. Studies of a variety of health behaviors have supported this hypothesis, although not uniformly. In two community-based surveys of adults ranging in age from 18 to 96 years, Guthrie, *et al* found little association between time perspective and smoking, obesity, and exercise (5,6).

In considering the literature, we noted that studies of adolescents and university students more consistently found associations between time perspective and health behaviors than did studies with a broader range of ages, including older adults (5–27). For example, eight studies have reported positive associations between time perspective and substance use, and the mean ages of participants in these studies were between 11 and 37 years (7–14). Among three studies reporting positive associations between time perspective and physical activity, the mean ages of the samples were 16, 19 and 67 years (14,19,20), while among four studies that did not find an association, the mean ages of the samples were 34, 44, 45, and 50 years

(5,6,16,18). We hypothesized that the heterogeneous results among studies was partly due to age-related differences in the association between time perspective and health behaviors. According to stage theories of health behavior, influences on decision-making are stage-dependent (28). Influences during stages of active decision-making may be different from those in the pre-consideration or pre-engagement stage or those affecting maintenance of a health behavior. We considered that time perspective may be a stage-dependent influence. If time perspective is most operational at the stage of decisional balance, when decisions are first contemplated and the benefits and costs evaluated, it may have great relevance for those facing the decision for the first time, and little relevance for those who have settled the question for themselves many years earlier. In turn, decisions regarding many health behaviors, including those related to substance use, exercise, and sexual activity, are first faced in adolescence and young adulthood. With this framework, we considered that for many common health behaviors, time perspective would be most relevant for young adults but not older adults. We tested this hypothesis in an examination of pooled data from two prior surveys.

METHODS

Design

We conducted two cross-sectional community-based surveys, one in 2006–2007 and one in 2008–2010 (5,6). Both surveys used the same procedures and questionnaires, but sampled different communities. The earlier survey was done in Silver Spring, Maryland, and had a sample that was designed to be balanced on gender and ethnicity, but reflected the local community in having relatively high socioeconomic status. The later survey was done in Hagerstown, Maryland and Martinsburg, West Virginia, two neighboring small cities in a semi-rural area. The socioeconomic status of this sample was slightly lower than the U.S. national average, and was done to determine if the findings of the first survey would be replicated in an area of lower socioeconomic status (6).

We performed the surveys in barbershops and beauty shops to reach a broad representation of members of the local community. Barbershops and beauty shops are patronized by large proportions of the population, provide an indoor and safe public space where patrons can complete the surveys while comfortably seated, and patrons have free time to complete the survey while waiting or being styled. Sixteen shops participated in the earlier survey and 11 shops participated in the later survey. Study personnel visited shops on both weekdays and weekends, explained the study to patrons, assessed eligibility, obtained verbal informed consent, and distributed the questionnaires. The study protocol was approved by the Office of Human Subjects Research.

Participants

Patrons who were age 18 or older, English-speaking, and able to provide informed consent were eligible to participate. Response rates among eligible participants were 90.3% and 86.1% in the earlier and later surveys, respectively, yielding samples of 531 and 267 participants (combined 798). We excluded eight participants because of missing data on key

variables (N = 6) or invariant responses on the time perspective scales (N = 2), for a total of 790 participants.

Measures

Participants completed an anonymous questionnaire that included questions on demographic characteristics, selected aspects of health, and three subscales of the Zimbardo Time Perspective Inventory (ZTPI) (2). Demographic characteristics included age, gender, ethnicity (white, black, Hispanic, other), and education level. Health behaviors included smoking (never, former, and current) and days of recreational exercise in the past week. We did not ask the duration or intensity of exercise. We also asked height and weight, from which we computed body mass index (weight in kilograms/height in square meters). We defined obesity as a body mass index ≥ 30 kg/m² (29). Although obesity is not itself a health behavior, it is largely determined by diet and physical activity. Self-reports of current smoking and recreational exercise have been found to be reliable and to have acceptable validity in national surveys, as has self-reported height and weight in those under age 60 (30–32).

The ZTPI is a 56-item questionnaire that assesses one's time perspective in five dimensions: future, present-fatalistic, present-hedonistic, past-positive, and past-negative (2). The theoretical framework of the ZTPI holds that time perspective is a multidimensional construct. Rather than characterizing individuals as necessarily either future-oriented or present-oriented, this multi-dimensional view considers that individuals may reflect more than one time perspective relative to different aspects of life. Alternatively, some individuals may predominantly have a future-orientation and be much less present-oriented (or *vice versa*) when considering decisions.

The ZTPI future subscale assesses perceptions of the importance of planning and immediate versus delayed consequences. The ZTPI present-fatalistic subscale assesses perceptions of luck or fate and lack of personal control over events in life. The ZTPI present-hedonistic subscale assesses the perceived value of spontaneity, risk-taking, and pleasure seeking. The ZTPI past-positive and past-negative subscales assess how often or how strongly either pleasant or unpleasant events from childhood or the past are remembered. To reduce respondent burden, we asked only the future, present-fatalistic, and present-hedonistic subscales, as these are more relevant for decision-making regarding health behaviors. Each item has a five-category Likert scale response. Subscale scores are the mean of responses, after reverse scoring as appropriate (possible range 1 – 5), with higher scores indicating more of the attribute. Cronbach's alpha coefficient of internal consistency reliability of these subscales has been reported to range from 0.74 to 0.80, and test-retest reliability to range from 0.72 to 0.80 (2,6). Construct validity of the ZTPI has been supported in structured interviews, and by associations with other psychological measures and risky behaviors (2,7,9–14, 22,24).

Analysis

We used mean imputation to compute ZTPI subscale scores for participants who had missing responses on some items. Imputation was done for the future subscale for 29

participants (3.6%), for the present-fatalistic subscale for 13 participants (1.6%), and for the present-hedonistic subscale for 40 participants (5.0%). Questionnaires were missing at most two items.

We stratified the sample into three age groups (18 – 24 years; 25 – 34 years; and 35 years and older), with the youngest group chosen to be similar to the college-age samples in previous studies, the oldest group as those more established with respect to their health behaviors, and the 25 – 34 year old group as transitional (33). Within each age group, we compared scores on the ZTPI subscales among exercise groups (no days, 1–2 days per week, 3 or more days per week) using analysis of variance, and between obese and non-obese participants, and current smokers and non-smokers, using t tests. We also compared ZTPI scores after adjustment for age, sex, ethnicity, and education level, using analysis of variance. Scores on each of the subscales were found to be normally distributed in preliminary analyses (Shapiro-Wilk $W > .982$).

Next, we used logistic regression models to test if the likelihood of current smoking or obesity was associated with each ZTPI subscale in the three age groups, and ordinal logistic regression models to test associations with exercise frequency. We used two approaches to test if the strength of association varied by age. First, we tested the significance of interactions between each ZTPI subscale and age group in models for each of the three health outcomes. Second, in a separate analysis using nested models, we tested homogeneity of the odds ratios of the ZTPI subscales across age strata. To do this, we specified a full model that include age group-specific ZTPI subscale variables and a reduced model that included a single variable for the ZTPI subscale, and used the likelihood ratio test to compare these models. The null hypothesis of the likelihood ratio test was that model fit was not different between the reduced and full model, which would support use of a single odds ratio for the ZTPI subscale. The alternative hypothesis was that at least one of the age-specific odds ratios was sufficiently different from the others that model fit was improved with separate age terms. The latter analysis would indicate whether specifying age-specific odds ratios was important, even if the more stringent requirements for effect modification were not met.

Each ZTPI subscale was tested in separate models, first in univariate models, and then in multivariate models that also included age, gender, ethnicity, and education level as independent variables. The results of the univariate and multivariate models were closely similar, and therefore we presented only the results of the multivariate models. The adjusted odds ratios provide estimates of the likelihood of more frequent exercise, obesity, and current smoking for each one-point increase in ZTPI subscale score. Analyses were performed using SAS version 9.2 programs (SAS Institute, Inc., Cary, NC).

RESULTS

The studies included 104 participants who were age 18 – 24, 176 participants who were age 25 – 34, and 510 participants who were age 35 and older. The samples were diverse in gender and ethnicity (Table 1). About 30% of participants in each age group reported not exercising. The proportion that was obese increased with age. About 14% of participants in

each age group were current smokers. In each age group, scores were highest on the ZTPI future subscale and lowest on the present-fatalistic subscale. Adjusting for differences in demographic characteristics, scores on the ZTPI future subscale were similar in the two surveys (3.76 versus 3.74), as were scores on the present-fatalistic subscale (2.47 versus 2.46) and present-hedonistic subscale (3.24 versus 3.23).

Participants in both the 18 – 24 age group and the 35 and older age group who reported more frequent exercise had higher scores on the future subscale than those who did not exercise, but in the adjusted analysis only the association in the 18 – 24 age group remained significant (mean $\pm$ standard error $3.67 \pm .08$ in those with ≥ 3 days per week of exercise versus $3.41 \pm .10$ in those with no exercise; $p < .05$) (Table 2). Those with a higher exercise frequency also had significantly lower scores on the present-fatalistic subscale, but only in the 18 – 24 age group ($2.59 \pm .10$ in those with ≥ 3 days per week of exercise versus $3.01 \pm .12$ in those with no exercise; $p < .05$). There was no association between exercise frequency and scores on the present-hedonistic subscale in any age group. Associations of time perspective with obesity also differed by age group. Participants age 18 – 24 who were obese had significantly lower mean scores on the future subscale than those who were not obese ($3.17 \pm .18$ versus $3.62 \pm .06$; $p < .05$) and significantly higher mean scores on the present-hedonistic subscale ($3.96 \pm .20$ versus $3.46 \pm .06$; $p < .05$). In contrast, there were no associations in the two older groups. Mean scores on the ZTPI subscales were not significantly different between current smokers and non-smokers in any age group.

In examining associations of ZTPI subscale scores with exercise frequency using logistic regression analysis, there were significant interactions between each ZTPI subscale and age group (p for interaction terms ranging from .02 to .05). Higher scores on the future subscale were associated with a greater likelihood of more frequent exercise in the 18 – 24 year age group (adjusted odds ratio 2.13; 95% confidence interval (CI) 1.00, 4.61), and higher scores on the present-fatalistic subscale were associated with a significantly lower likelihood of more frequent exercise (adjusted odds ratio 0.49 95% CI 0.26, 0.91) in this age group (Figure 1). Neither the future nor present-fatalistic subscale was associated with exercise frequency in the two older age groups. The present-hedonistic subscale was not associated with exercise frequency in any age group.

There was no evidence of interactions between ZTPI scores and the likelihood of obesity (p for interaction terms ranging from 0.06 to 0.30). However, there was evidence against homogeneity of odds ratios among age groups for the future subscale ($p < .0001$), as well as for the present-fatalistic subscale ($p = .0007$) and the present-hedonistic subscale ($p = .0003$). ZTPI scores were associated with the likelihood of obesity only in the 18 – 24 year age group. Each 1-point increase in the future score was associated with lower risk of obesity in this age group (adjusted odds ratio 0.20; 95% CI 0.04, 0.94), while each 1-point increase in the present-hedonistic score was associated with a higher risk of obesity in this age group (adjusted odds ratio 4.28; 95% CI 1.19, 15.37). Higher scores on the present-fatalistic subscale also tended to be associated with a higher likelihood of obesity among 18 – 24 year olds (adjusted odds ratio 2.70 for each 1-point increase), but this was not statistically significant (95% CI 0.82, 8.83). There were no associations between ZTPI scores and the likelihood of obesity in the two older age groups. There were no associations

between ZTPI scores and the likelihood of smoking in any age group, and no evidence of either interactions by age group (all $p > .55$) or inhomogeneity of odds ratios across age groups (all $p > .89$).

We considered that some of those aged 18 – 24 may still be in school, and their education level at the time of the survey might underestimate their eventual educational attainment. This may impact possible confounding by education level. We therefore performed a sensitivity analysis in which we coded all those aged 18 – 24 who reported having at least 13 years of education as having 16 years of education. Results of logistic regression models using these data were closely similar, with adjusted odds ratios differing by no more than 0.1 from the original results.

DISCUSSION

In these large community-based samples, we found that the associations between time perspective and selected health behaviors differed substantially by age. Strong associations were evident in the youngest age group (age 18 – 24), with lower likelihoods of physical inactivity and obesity among those who were more future-oriented, and higher likelihoods of physical inactivity and obesity among those who were more present-oriented. In these emerging adults, many health-related behaviors are still evolving, and may therefore be more susceptible to considerations of the future. No associations were present in those aged 25 – 34 or age 35 and older, as might be expected if decisions regarding these aspects of health had been made earlier in life. With this developmental viewpoint, time perspective may be expected to be a less relevant influence on decision-making related to these behaviors later in life for most people.

The age-specific associations between time perspective and health behaviors are consistent with predictions of stage theories of health behavior (34). Central to stage theories is the concept that influences on behavior that are important at one stage are not necessarily important during other stages. For example, the precaution adoption process model proposes that outcome expectancies operate in stage 3 (deciding about acting), stage 4 (deciding to act) and stage 5 (deciding not to act), but not at other stages (35). Time perspective would be anticipated to be most relevant for people in stages 3, 4, or 5, and not relevant for those in either early stages or later (maintenance) stages. With respect to smoking, exercise, and keeping a healthy weight, older adults are most likely in the maintenance stage. Consequently, these behaviors may be removed from the influences of time perspective. However, for younger adults who are still in the process of decision-making, time perspective is relevant in shaping their behavior.

Our findings reconcile some of the differences in reported associations between time perspective and health behaviors. Much research has involved adolescents or university students. These studies largely found substantial associations between time perspective and health behaviors, regardless of whether the behavior was risky or illegal (like substance use or unsafe driving) or commonplace (like diet and exercise). Studies of broader segments of the population have been notably less consistent. We suggest that the age differences in the samples accounts for much of this difference. Associations with time perspective in the

community samples that have been studied may be dependent on the proportion of young people included in the sample.

Elderly individuals and those in poorer health are less future-oriented and more fatalistic than young adults and those in better health (5,6,36). Poorer health and a shorter time horizon, in addition to a later stage of decision-making with respect to health behaviors, likely contribute to diminished associations between time perspective and exercise, weight, and smoking in older adults (37). The good health and long time horizon of young people may also provide the backdrop needed for time perspective to operate.

We did not find associations with current smoking, even in the youngest age group. This may reflect that time perspective has different influences among health behaviors. It may also be that smoking is such a strong addiction that it quickly becomes automatic and divorced from outcome expectancies, even among young smokers (38,39). Arguing against this possibility is evidence from previous studies of associations with smoking (14–16), albeit not uniformly (8,17). It is also possible that our study missed an association between time perspective and smoking by not including participants younger than age 18. Experimentation with smoking most often occurs in pre-adolescence and adolescence (40–42). Time perspective may be most relevant for decisions related to smoking uptake during these ages. Although some studies suggest that up to 25% of non-smokers at age 18 start to smoke in later years (43,44), most smokers begin before age 18 (45). Our null findings with respect to time perspective and smoking may be a consequence of not having included the most relevant age group. We may have also had limited statistical power to detect an association due to the small number of young smokers, although associations were seen between time perspective and obesity with even fewer obese participants.

The strengths of this study include two large community-based samples, high survey response rates, and testing of associations with both future and present orientations. Although we studied convenience samples, the prevalences of exercise, obesity, and smoking were closely similar to those of the general population in these areas, suggesting that the samples were largely representative. This study is limited by its cross-sectional design, which does not allow us to know the direction of association between time perspective and exercise frequency or obesity, and by the self-reported nature of the data. The study is also limited in using the ZTPI as the sole measure of time perspective, and by not examining other psychological constructs that may be associated with exercise or obesity. Other measures may have detected associations not found with the ZTPI (16), but we limited the length of the questionnaire due to concerns about respondent burden. We also asked about only three common aspects of health. Other behaviors, including illegal or risky behaviors, may not demonstrate similar age-specific associations with time perspective. Also, we did not study younger adolescents, which as noted above, may have limited our ability to detect associations with smoking behavior.

This study suggests the importance of situating time perspective in both a stage model of health behavior decision-making and using a developmental perspective. For exercise and obesity, our results indicate the presence of an age-related window in young adulthood during which decision-making is associated with time orientation. Health education

interventions that emphasize the future consequences of these aspects of health may have greater impact on young adults. By extension, time perspective may have great relevance for middle-aged or older adults when they first face new decisions, such as acceptance of cancer screening, attendance to health maintenance visits, and adherence to medications after the first diagnosis of a chronic illness. Accurate appraisal of the role of time perspective will derive from examination of people as they first approach these decisions.

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SO WHAT?

What is already known on this topic?

Time perspective has been associated with a variety of health behaviors in selected samples, but associations have not been consistent in general population samples.

What does this article add?

This article demonstrates that age is an important modifier of the association between time perspective and health behaviors, with associations only among young adults age 18 to 24, and no associations among older adults.

What are the implications for health promotion practice or research?

Health promotion messages that focus on future benefits of present-day behavior are more likely to be successful when targeted at young adults than at older adults. Research should focus on identifying other motivators for older adults.

Figure 1.

Adjusted odds ratios of the likelihood of more frequent exercise (top), obesity (middle), and current smoking (bottom) by score on the Zimbardo Time Perspective Inventory (ZTPI) future subscale, present-fatalistic subscale, and present-hedonistic subscale, among participants in the three age groups. Age groups are represented within each panel from left to right: age 18 – 24 (dots), age 25 – 34 (circles) and age 35 and older (diamonds). Odds ratios represent the change in odds associated with a 1-point increase in subscale score (possible range 1 – 5). Odds ratios were adjusted for age, gender, ethnicity, and education level. Error bars represent 95% confidence intervals.

Table 1

Characteristics of participants by age group*.

	Age 18 – 24 (n = 104)	Age 25 – 34 (n = 176)	Age 35 and older (n = 510)
Age, years	20.7 ± 1.9	29.0 ± 2.9	55.6 ± 15.0
Men, N (%)	44 (42.3)	93 (52.8)	249 (48.8)
Ethnicity, N (%)			
White	23 (22.1)	36 (20.5)	278 (54.5)
Black	50 (48.1)	99 (56.2)	160 (31.4)
Hispanic	18 (17.3)	24 (13.6)	34 (6.7)
Other ethnicity	13 (12.5)	17 (9.7)	38 (7.4)
Years of education, N (%)			
0 – 11	14 (13.5)	14 (7.9)	42 (8.2)
12	33 (31.7)	43 (24.4)	142 (27.9)
13 – 15	47 (45.2)	52 (29.6)	120 (23.5)
16 or more	10 (9.6)	67 (38.1)	206 (40.4)
Current smoker, N (%)	15 (14.4)	26 (14.7)	68 (13.3)
Obese, N (%)	10 (9.9)	34 (19.8)	134 (26.7)
Exercise days per week, N (%)			
0	32 (30.8)	61 (34.9)	151 (29.7)
1 – 2	22 (21.1)	52 (29.7)	127 (25.0)
3 or more	50 (48.1)	62 (35.4)	230 (45.3)
ZTPI future	3.59 ± 0.6	3.81 ± 0.6	3.77 ± 0.5
ZTPI present-fatalistic	2.70 ± 0.9	2.30 ± 0.8	2.48 ± 0.8
ZTPI present-hedonistic	3.50 ± 0.6	3.28 ± 0.6	3.17 ± 0.6

* Plus-minus values are mean ± standard deviation.

Table 2

Mean scores on the Zimbardo Time Perspective Inventory (ZTPI) future, present-fatalistic, and present-hedonistic subscales by exercise frequency, obesity, and current smoking status, among participants in the three age groups. Values are means (standard errors). Each ZTPI subscale has a possible range of 1 to 5, with higher scores indicating more of the attribute..

	Age 18 – 24		Age 25 – 34		Age 35 and older	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
ZTPI Future						
0 exercise days	3.38 (.09)	3.41 (.10)	3.82 (.07)	3.85 (.07)	3.68 (.04)	3.72 (.04)
1 – 2 exercise days	3.58 (.11)	3.59 (.12)	3.73 (.08)	3.72 (.07)	3.80 (.05)	3.78 (.04)
3 or more exercise days	3.73 (.07) *	3.67 (.08) *	3.87 (.07)	3.85 (.07)	3.81 (.03) *	3.79 (.03)
ZTPI Present-fatalistic						
0 exercise days	3.00 (.12)	3.01 (.12)	2.35 (.10)	2.30 (.09)	2.60 (.06)	2.52 (.06)
1 – 2 exercise days	2.59 (.14)	2.59 (.14)	2.25 (.11)	2.26 (.10)	2.46 (.07)	2.50 (.06)
3 or more exercise days	2.55 (.09) **	2.59 (.10) *	2.28 (.10)	2.33 (.09)	2.42 (.05)	2.45 (.05)
ZTPI Present-hedonistic						
0 exercise days	3.66 (.11)	3.66 (.11)	3.19 (.08)	3.18 (.08)	3.08 (.05)	3.07 (.05)
1 – 2 exercise days	3.41 (.13)	3.43 (.13)	3.28 (.08)	3.31 (.08)	3.22 (.05)	3.23 (.05)
3 or more exercise days	3.44 (.09)	3.48 (.09)	3.38 (.08)	3.36 (.08)	3.21 (.04)	3.22 (.04)
ZTPI Future	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Current non-smokers	3.59 (.06)	3.56 (.06)	3.81 (.04)	3.80 (.04)	3.77 (.02)	3.76 (.02)
Current smokers	3.56 (.16)	3.65 (.14)	3.81 (.10)	3.85 (.10)	3.77 (.06)	3.83 (.06)
ZTPI Present-fatalistic						
Current non-smokers	2.69 (.07)	2.72 (.07)	2.30 (.06)	2.31 (.06)	2.46 (.07)	2.48 (.03)
Current smokers	2.74 (.17)	2.69 (.18)	2.31 (.14)	2.24 (.14)	2.60 (.10)	2.50 (.09)
ZTPI Present-hedonistic						
Current non-smokers	3.48 (.06)	3.52 (.06)	3.27 (.05)	3.28 (.05)	3.17 (.03)	3.17 (.03)
Current smokers	3.64 (.21)	3.55 (.16)	3.32 (.11)	3.29 (.12)	3.20 (.08)	3.19 (.07)
ZTPI Future	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Not obese	3.63 (.06)	3.62 (.06)	3.84 (.05)	3.83 (.04)	3.79 (.03)	3.78 (.03)
Obese	3.27 (.17) *	3.17 (.18) *	3.70 (.09)	3.75 (.09)	3.73 (.04)	3.74 (.04)

	Age 18 – 24		Age 25 – 34		Age 35 and older	
ZTP1 Present-fatalistic						
Not obese	2.67 (.07)	2.69 (.07)	2.27 (.06)	2.30 (.06)	2.45 (.04)	2.46 (.04)
Obese	3.04 (.21)	3.10 (.23)	2.34 (.13)	2.25 (.12)	2.55 (.07)	2.53 (.06)
ZTP1 Present-hedonistic						
Not obese	3.45 (.06)	3.46 (.06)	3.31 (.05)	3.31 (.05)	3.16 (.03)	3.16 (.03)
Obese	3.74 (.18)	3.96 (.20) *	3.16 (.10)	3.16 (.10)	3.23 (.05)	3.22 (.05)

Values are adjusted means based on multivariate analysis of variance models that also included age, gender, ethnicity, and education level. Comparisons are across levels of exercise frequency and between smoking and obesity categories within age groups, and are based on t statistics from these adjusted models.

* P < .05;

** P < .01