Published in final edited form as:

J Health Commun. 2015 ; 20(2): 134–146. doi:10.1080/10810730.2014.917745.

Physical Activity in Young Adults: A Signal Detection Analysis of Health Information National Trends Survey (HINTS) 2007 Data

Carmina G. Valle,
Department of Nutrition, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill

Deborah F. Tate,
Departments of Nutrition and Health Behavior, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill

Deborah K. Mayer,
School of Nursing, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill

Marlyn Allicock,
Department of Nutrition, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill

Jianwen Cai, and
Department of Biostatistics, University of University of North Carolina at Chapel Hill

Marci K. Campbell
Department of Nutrition, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill

Abstract

Many young adults are insufficiently active to achieve the health benefits of regular physical activity (PA). We examined distinct subgroups of young adults (18–39y) that vary in their likelihood of not meeting PA recommendations using signal detection analysis of data from the Health Information National Trends Survey 2007. The sample was randomly split and signal detection analysis was conducted on the exploratory half to identify subgroups and interactions among sociodemographic and health communication variables that predicted engaging in <150 weekly minutes of moderate-intensity PA (low PA). Rates of low PA among subgroups were compared with similarly defined subgroups in the validation sample. Overall, 62% were not meeting PA recommendations. Among eight subgroups identified, low PA rates ranged from 31%-90%. Predictors of low PA were general health, BMI, perceived cancer risk, health-related Internet use, and trust in information sources. The least active subgroup (90% low PA) included young adults in poor to good health with a BMI≥30.8 (obese). The most active subgroup (31% low PA) comprised those in very good to excellent health, who used a website to help with diet, weight

Correspondence concerning this article should be addressed to Carmina G. Valle, Department of Nutrition, University of North Carolina at Chapel Hill, CB #7461, Chapel Hill, NC 27599, USA. carmina.valle@unc.edu. Phone: (919) 966-5047.

or PA, and had no to little trust in health information on television. Findings suggest potential intervention communication channels and can inform targeted PA interventions for young adults.

Keywords

physical activity; young adults; signal detection; health communication

There is strong evidence that more physically active adults are at lower risk for all-cause mortality, heart disease, high blood pressure, stroke, type 2 diabetes and some cancers (e.g., Kushi et al., 2012; Physical Activity Guidelines Advisory Committee (PAGAC, 2008)). National physical activity (PA) guidelines recommend that adults engage in at least 150 weekly minutes of moderate-intensity, or 75 weekly minutes of vigorous-intensity aerobic activity for improved health (PAGAC, 2008). However, according to self-reported data, about 40% of US young adults, ages 20 to 39, are not meeting these recommended levels (Tucker, Welk, & Beyler, 2011) and may be insufficiently active to achieve the health benefits of regular PA.

Decreased PA has been identified as an important risk factor for weight gain during young adulthood (Hankinson et al. 2010), and studies show that young adults have the highest rate of weight gain (Malhotra, Ostbye, Riley, & Finkelstein, 2013; Truesdale et al., 2006). Weight gain during young adulthood is associated with the development of cardiovascular disease risk factors (Norman, Bild, Lewis, Liu, & West, 2003; Truesdale et al., 2006) and increased prevalence of metabolic syndrome, diabetes and some cancers (Carthenon et al., 2004; Eliassen, Colditz, Rosner, Willett & Hankinson, 2006; Lu et al., 2011). For young adults, this can mean many more years at increased risk for obesity and its associated health problems, making them a particularly important population in need of health promotion interventions. Although informational and behavioral interventions have effectively increased PA among various age groups (Heath et al., 2012), there is limited evidence to inform the development of effective lifestyle interventions for young adults (Hebden, Chey, & Allman-Farinelli, 2012).

Identifying correlates of PA and elucidating appropriate communication and information sources are important for guiding the development of targeted interventions to enhance PA behaviors in this population. While previous studies among young adults have identified several sociodemographic and cognitive factors as PA determinants (Dowda et al, 2003; Rovniak, Anderson, Winett, & Stephens, 2002; VanKim, Laska, Ehlinger, Lust, & Story, 2010), there is little evidence describing the possible interactions among PA correlates and characterizing various subgroups with low PA participation (Atienza et al., 2006).

Additionally, few studies have examined health communication preferences for delivering PA interventions for young adults (Crutzen et al., 2011); describing use and attention to health communication channels may be helpful for developing effective PA interventions. Although decision prompts, mass media and community-wide campaigns have been effective communication-based approaches to PA interventions (Heath et al., 2012), the dynamic growth and use of new technology, especially among young adults, has made it increasingly important to investigate the potential to deliver health communication

interventions through emerging media (Bernhardt, Chaney, Chaney, & Hall, 2013). The Health Information National Trends Survey (HINTS) represents a unique resource that allows for assessment of several communication channels and health information sources over time. Prior HINTS analyses on PA have focused on awareness of PA recommendations or PA as it relates to cancer prevention (Bennett, Wolin, Puleo, Mâsse, & Atienza, 2009; Coups, Hay & Ford, 2008; Hawkins, Berkowitz & Peipins, 2010; Oh et al., 2010), or PA as a potential correlate of cancer prevention behaviors, cancer information seeking, and obesity beliefs (Hay, Coups, & Ford, 2006; Shim, Kelly, & Hornik, 2006; Wang & Coups, 2010). Few have examined interactions among multiple characteristics in describing PA subgroups (Atienza et al., 2006), and none have focused on young adults as a distinct subgroup.

This study extends previous literature characterizing PA correlates and communication preferences in young adults by examining distinct subgroups of young adults that vary in their likelihood of not meeting moderate-intensity PA recommendations using signal detection methodology with 2007 HINTS data. The objectives of this study were to identify mutually exclusive subgroups of young adults that vary in their likelihood of not meeting PA recommendations, and to describe higher-order interactions among sociodemographic, health and communication characteristics that may predict PA in young adults. In addition, we determined whether the subgroups identified in signal detection analyses (SDA) were stable in a separate set of HINTS data. Our analyses were exploratory in nature with the goal of generating future hypotheses related to PA behaviors and PA interventions among young adults.

Methods

Data Source

Data were drawn from the 2007 HINTS, a cross-sectional survey conducted by the National Cancer Institute (NCI) to assess the American public's health information seeking and use (see hints.cancer.gov and Cantor et al., 2009). The survey collects nationally representative data from US adults (ages 18+), and datasets are publicly available for each of the iterations (2003, 2005, 2007), all of which were collected in English and Spanish. The HINTS instrument employs items from various origins, including existing national surveys (e.g., Behavioral Risk Factor Surveillance System) and original items. Prior to survey administration, items were cognitively tested to confirm they are psychometrically sound.

Data Collection and Sample

The 2007 HINTS collected data from January-April 2008 through computer-assisted telephone interviews using a list-assisted random digit dial (RDD) sample (n=4092) and mailed paper-and-pencil questionnaires using a stratified cluster sample from a list of US addresses that oversampled minorities (n=3582). The weighted response rate was 24.2% for the RDD sample and 31.0% for the address-based sample (Cantor et al., 2009). Consistent with age limits defined by the Adolescent and Young Adult Oncology Progress Review Group (2006), the study sample comprised young adults, ages 18–39 (n=1619). Although previous PA studies have focused on more narrow age subgroups (e.g., 18–25), SDA allowed

for examination of age subgroups within the 18–39 range and identification of a distinct age cutpoint, since we included age as a continuous independent variable.

Measures

PA outcome—The binary outcome of not meeting PA recommendations (<150 minutes/ week of moderate-intensity PA) was derived from three items. One item assessed any PA participation over the past month: "*During the past month, did you participate in any physical activities or exercises such as running, yoga, golf, gardening, or walking for exercise?*" Respondents who answered "No" were classified as not meeting PA recommendations. Those who answered "Yes" were asked two follow-up questions about duration of moderate-intensity PA (i.e., days they do any PA and typical duration of activities). Using the product of these two measures, weekly minutes of moderate-intensity PA were calculated. Participants were then classified as either meeting (≥150 minutes/week, subsequently described as high PA) or not meeting the weekly PA recommendation (<150 minutes/week, referred to as low PA).

PA Correlates—In this exploratory study, rather than defining inclusion criteria for predictor variables, we selected several variables that have predicted PA behaviors across observational and intervention studies. To facilitate comparability, we included measures used in previous PA-related HINTS analyses (Atienza et al., 2006) and SDA of PA correlates (King et al., 1997; King et al., 2006). Additionally, we used sociodemographic, health, and psychosocial variables identified in systematic reviews of PA determinants (Kahn et al., 2002; Wendel-Vos, Droomers, Kremers, Brug, & Van Lenthe, 2007). Since behaviors cluster within individuals and populations (Coups, Ayorkor, & Orleans, 2004), we included health beliefs and behaviors that have been shown to interrelate more with PA behaviors (i.e., fruit and vegetable (FV) consumption smoking) (Lippke, Nigg & Maddock, 2012). Several communication-related variables were included that could be useful for identifying appropriate communication channels for reaching subgroups. As this was an exploratory study and the HINTS survey uniquely includes a variety of communication channels, we used all of the available health information sources.

Sociodemographics and health status: Self-reported measures included age (continuous), gender, annual household income, education, marital status, employment status and race/ ethnicity, general health (excellent to poor), health insurance (yes/no), seeing a regular health provider (yes/no), ever diagnosed with cancer (yes/no), and family members ever having cancer (yes/no). Using respondents' self-reported height and weight, body mass index (BMI) was calculated as weight (kg)/height $(m)^2$ (continuous).

Health beliefs and behaviors: Participants were asked if they believe exercise decreases the chances of getting some cancers (yes/no), about their knowledge of recommended PA levels (<150 minutes per week/ ≥150 minutes per week) and recommended daily FV intake (<5 or >9 servings/ 5–9 servings) for the average adult, FV consumption (continuous), and smoking history (smoked ≥100/ smoked <100 cigarettes). Questions regarding participants' health-related perceptions were about the likelihood of developing cancer in the future (very low to very high), worry about getting cancer (rarely/never to all the time), and confidence in their

ability to take good care of their health (health-related self-efficacy: completely confident to not at all confident).

Health information seeking: To characterize health communication behaviors and experiences, the following items were included: (1) ever looked for health-related information (yes/no); (2) where looked for health information first; (3) an information-seeking experiences scale, calculated from the mean of four items about their most recent information search (Hesse, Arora, Beckjord, & Rutten, 2008) (*took a lot of effort to get information*, *felt frustrated during information search*, *concerned about information quality*, *information was hard to understand*: strongly agree to strongly disagree); (4) confidence in getting health-related information/advice (completely confident to not confident at all); and (5) ever went online to access the Internet or email (yes/no). Participants that reported using the Internet were asked if during the past year they had done nine separate actions while using the Internet (see Table 1). Additionally, respondents were asked how much they trust health or medical information (a lot to not at all) from nine different sources (see Table 1).

Data Analyses

Stata IC/Version 11 (StataCorp, College Station, TX) was used to conduct descriptive analyses on the sample (N=1619). Using NCI guidelines on testing mode effects in HINTS analyses (Rizzo, Moser, Waldron, Wang, & Davis, 2008), the RDD full-sample and mail full-sample weights were used to produce two different US population estimates for the outcome variable and its relationships with indicator variables. Since differences in variables by survey mode were rarely statistically significant in this exploratory study, data from both modes were combined into one sample for analyses. Descriptive and bivariate analyses were conducted to examine differences in characteristics between high PA and low PA participants.

Next, the sample was randomly split to create exploratory and validation samples. We used split-sample validation procedures and SDA approaches employed in previous studies (Atienza et al., 2006; Davis et al., 2009; King et al., 2010; Sullivan & Rutten, 2009), conducting the SDA with Signal Detection Software for Receiver Operating Characteristics (ROC4) (Department of Veteran Affairs, 2002). From the original sample of n=1619, data on meeting PA recommendations were missing for 92 respondents, leaving randomly-split samples of n=757 and n=770. SDA were conducted on the exploratory sample (n=757) using low PA as the outcome measure and all indicator variables. Since SDA cannot utilize survey sampling weights, these exploratory analyses used unweighted data. The ROC4 program partitioned data, employing a weight of r=0.5 to optimize both specificity and sensitivity in detecting low PA. ROC4 calculated the first optimal cutpoint for the best indicator variable that split the data into two homogenous subgroups that were maximally differentiated in their likelihood of low PA. Through recursive partitioning, the most significant correlates of low PA were identified, splitting the sample into mutually exclusive subgroups. The resulting model combined independent variables with “and/or” decision rules that optimally predicted low PA and identified subgroups of individuals who shared characteristics that predicted their PA status. Subgroups were partitioned until no additional indicator variables

significantly predicted the outcome (p<.01) and/or partitioning resulted in no fewer than 25 individuals per subgroup.

Using the variables and cutpoints identified in the exploratory sample, we created homogeneous subgroups in the validation sample (n=770) using STATA IC/Version 11 and incorporating sampling weights. Proportions of low PA were calculated in these validation subgroups, and chi-square analyses (Cochran-Mantel-Haenzel test) were used to compare them to the proportions of low PA in the exploratory subgroups. If the levels of low PA were not significantly different between corresponding subgroups in the exploratory and validation samples, this would support the stability of the SDA results (Atienza et al., 2006).

To further characterize the subgroups identified in the exploratory sample, descriptive analyses were performed on the exploratory and validation samples combined using all indicator variables in the original analyses and incorporating sampling weights. Differences in characteristics among the exploratory and validation samples combined were explored by conducting chi-square and ANOVA tests with pairwise comparisons and Bonferroni adjustment to correct for multiple comparisons.

Results

Demographics

Among young adults with PA outcome data (n=1527), 62.2% were not engaging in recommended levels of moderate-intensity PA (i.e., performing <150 minutes/week). Over half of participants were women, white, employed, and married or living as married (Table 1). On average, young adults were 30.2±6.2 years old, had completed some college (30.3%), and were overweight (BMI, 26.8±6.5). Compared to young adults with high PA, participants with low PA were more likely to be women, non-white, married or living as married, and less likely to have health insurance, were older, less educated, of lower income, higher BMI, and in poorer general health. Low activity participants were less likely to believe that exercise lowers cancer risk, know PA recommendations, consume ≥5 daily FV servings, and be less confident about taking care of their health. Those with low PA were less likely to have ever sought health-related information, had poorer experiences searching for health information, and were less confident in getting needed health-related information. The groups differed on Internet use with low activity participants less likely to use email or Internet to communicate with a doctor or doctor’s office, to use a website to help with diet, weight or PA, and to download to a portable device, compared to active participants. Trust in health information on television and from religious organizations was higher among participants with low PA compared to those with high PA.

Low PA Predictors in SDA

Eight subgroups of young adults with varying rates of low PA were identified in the exploratory sample (n=757). Subgroup partitioning is displayed in Figure 1, with 62.8% of the sample reporting low PA. Predictors of low PA were general health, BMI, use of the Internet for health-related functions, trust in health information from communication channels, and perceived cancer risk.

Young Adults in Poor to Good General Health—General health emerged as the strongest predictor of low PA and differentiated the sample into two homogeneous groups—participants reporting poor to good health and participants reporting very good to excellent health. Among those in poorer general health, BMI was the next predictor of low PA, with SDA identifying a cutpoint of 30.8 kg/m^2. Young adults who reported poor to good health and were obese (BMI≥30.8) comprised the subgroup with the highest proportion of individuals with low PA (subgroup 8, 89.7%).

Further splitting of the group in poorer general health and BMI<30.8 identified BMI of 27.9 as a cutpoint, resulting in a subgroup of overweight (BMI≥27.9) young adults with over half reporting low PA (subgroup 5, 55.6%). Among participants with BMI<27.9, perceived likelihood of developing cancer was the next significant predictor of low PA, which distinguished between subgroups 6 and 7. Young adults in subgroup 6 (60.0% low PA) perceived their cancer risk as somewhat high to very high, while those in subgroup 7 (79.5% low PA) reported a cancer risk of very low to moderate.

Young Adults in Very Good to Excellent General Health—Among young adults in better general health, use of a website to help with diet, weight or PA was the next significant predictor of low PA. Users of these websites were further distinguished into subgroups by their trust in health or medical information on television. The subgroup with the highest rate of individuals meeting PA recommendations (subgroup 1, 31.3% low PA) had no to little trust in health information on television, while subgroup 3 (57.9% low PA) reported some to a lot of trust in health information on television.

For participants in better health that had not used a website to help with diet, weight or PA, trust in health information on the Internet was the subsequent predictor of low PA. Subgroup 2, with the second highest proportion of young adults meeting PA recommendations (38.9% low PA), included those with no to little trust in health information on the Internet. Participants that had some to a lot of trust in health information from the Internet comprised the subgroup with the third-highest proportion of low PA young adults (subgroup 4, 65.1%).

Comparison of Exploratory and Validation Samples

The rates of low PA were comparable across exploratory and validation samples when stratifying by subgroups (Figure 2). When comparing the percentages of low PA between the samples using weighted data by subgroup, significant differences were found for subgroup 4 (67.0 % vs. 49.5%, p=0.02) and subgroup 8 (90.8% vs. 66.8%, p=0.001). However, when testing the association between sample and proportion of low PA while adjusting for the eight subgroups, there was no significant difference between the exploratory and validation samples (Cochran-Mantel-Haenszel χ^2=0.81, p=0.37), suggesting stability of the SDA results across samples.

Subgroups with Highest Percentage of Inadequate PA

Characteristics of the eight subgroups of low PA among the full sample are displayed in Table 2. When examining defining characteristics of subgroups beyond those that significantly distinguished them through SDA (Table 2 in bold), several differences emerged

among the groups. Individuals in the subgroup with the highest proportion of inadequate PA (subgroup 8) were older and had the lowest education level of all the subgroups. This subgroup also had the second-highest scores of perceived cancer risk (3.1=moderate), more frequent worry about getting cancer, and lower confidence in taking good care of one's health. While participation in an online support group for health issues was low in the overall sample, more individuals in subgroup 8 had participated relative to other subgroups.

The subgroup with the next highest proportion of low PA (subgroup 7) comprised individuals with the lowest perceived cancer risk. Individuals in this subgroup were younger, of lower income, and had the lowest BMI compared to all other subgroups. Almost half of individuals in Subgroup 7 were non-white, and less than a third had used a website to help with diet, weight or PA.

Subgroups with Lowest Percentage of Inadequate PA

Those in the subgroup with the lowest proportion of inadequate PA (subgroup 1) were more likely to be white, have the highest education level, know and consume the recommended daily FV intake, and less likely to have smoked 100 cigarettes. Information-seeking experiences were more positive, and confidence in taking good care of their health was higher in subgroup 1. These young adults reported the lowest trust in health information on the radio and television, and from charities and religious organizations.

Similarly, the subgroup with the second-lowest proportion of inadequate PA (subgroup 2) had the lowest trust in health information in newspapers/magazines, on the Internet, and from government and charitable organizations. Subgroup 2 also was characterized by higher income levels, lower perceived cancer risk and worry about getting cancer, and higher confidence in taking good care of their health.

Discussion

Eight subgroups of young adults were more or less likely to not meet PA recommendations of at least 150 weekly minutes of moderate-intensity PA; the two subgroups most likely to not meet recommendations were characterized by poorer general health—one was further characterized by obesity and the other by overweight status and a low perceived risk of developing cancer in the future. The two other subgroups with poorer general health and over half reporting low PA were further defined by a BMI≥27 or BMI<27 and high perceived cancer risk. Four subgroups in better general health were distinguished by use of the web to help with diet, weight or PA and trust in health information on the television or the Internet. Of these subgroups, the two most likely to meet PA recommendations were defined by using these websites and low trust in health information on television, or no use of the websites and low trust in health information from the Internet. This SDA among young adults drawn from a nationally-representative sample revealed distinctive subgroups and higher-order interactions among various correlates of low PA that might not have been identified through more traditional logistic regression methods. Several characteristics significantly differed among the eight subgroups, which allowed for robust segmentation of young adults into groups to potentially focus on in future PA promotion interventions. The subgroup with the highest percentage of inadequate PA reported poor to good health, were

obese, had the lowest education level, and were older (Mean=30.8 years) relative to the other subgroups. The second-highest inadequate PA subgroup was composed of individuals in poorer health with lower BMI, that were younger (Mean=27.0 years), of lower income, and perceived a low likelihood of getting cancer in the future. These findings highlight the variability in sociedemographic and health communication characteristics across subgroups of young adults that are more or less likely to engage in recommended levels of PA.

The identification of general health and BMI as the strongest correlates of low PA in young adults is consistent with results of a prior study of 2005 HINTS data that characterized subgroups of sedentary adults (Atienza et al., 2006). While studies have consistently shown PA behavior to be inversely associated with age in adults (Trost, Owen, Bauman, Sallis, & Brown, 2002; Tucker et al., 2011), significant variability in correlates of low PA was found across subgroups of young adults. The inverse association between PA and BMI have been reported in numerous studies, and considering that over half of adults ages 20–39 are overweight or obese (Flegal, Carroll, Ogden, & Curtin, 2010), PA promotion in the context of weight loss interventions that are targeted to the specific needs of young adults may be warranted (Gokee-LaRose et al., 2009).

Contrary to a previous study that found no association between physical inactivity and perceived cancer risk (Honda & Neugut, 2004), two subgroups were distinguished by varied perceptions of the likelihood of getting cancer. As greater awareness and media surrounding cancer in young adults has recently emerged (Gorman, 2011), recognition of physical inactivity as a risk factor for some cancers may potentially influence risk behaviors among young adults. Previous HINTS findings have demonstrated that PA engagement is more likely among cancer information seekers (Shim et al., 2006) and those with knowledge of PA as a cancer prevention behavior (Hawkins et al., 2010). These variables did not emerge as important predictors of PA in the current study among young adults, highlighting the importance of identifying the multi-faceted and aggregate characteristics of various subgroups.

The classification of subgroups by communication-related behaviors may have important implications for targeting young adults using various media. Several studies have shown the Internet as a key health information source (Dobransky & Hargittai, 2012; Hesse et al., 2005; Rice, 2006). While Internet-based PA interventions have frequently been tested in randomized trials, they have had varying degrees of success (LaPlante & Peng, 2011; Vandelanotte, Spathonis, Eakin, & Owen, 2007). A systematic review of eHealth interventions for PA (LaPlante & Peng, 2011) found that only one of seven studies specifically aimed at college students demonstrated effectiveness for improving exercise behaviors (Parrott, Tennant, Olejnik & Poudevigne, 2008). Using the web for help with diet, weight or PA was a distinguishing characteristic among groups, suggesting that Internet-based interventions may be more appropriate for some young adults as opposed to others that might prefer non Internet-based formats. Studies on weight control in young adults have emphasized that standard weight loss programs may not adequately meet their needs, and alternate delivery schedules and formats are warranted (Gokee LaRose, Tate, Gorin, & Wing, 2010; Gokee-LaRose et al., 2009). Our findings have identified health communication-related characteristics specific to subgroups of young adults with varying

correlates of PA and add to the limited literature guiding the development of effective lifestyle interventions for this age group. Research on understanding what contributes to the effectiveness of web-based and technology-based PA interventions among young adults deserves future attention.

Lower trust in health information on the Internet defined one subgroup, while lower trust in health information on television defined another, both of which consisted of the smallest proportions of young adults reporting inadequate PA. A study of PA behaviors in adults with type 2 diabetes showed physicians and television to be the main PA-related information sources (Plotnikoff, Johnson, Karunamuni & Boule, 2010). While incorporation of health-related storylines in television have the potential to impact viewers' knowledge, attitudes and health behaviors (Marcus, Huang, Beck, & Miller, 2010), exercise-related depictions are relatively uncommon compared to other health issues (Murphy, Hether, & Rideout, 2008). Entertainment education approaches that explore the potential for television and other emerging media (e.g., online videos) to influence PA-related behaviors in young adults might be worth pursuing.

The two subgroups with over three quarters of young adults reporting low PA (subgroups 7 and 8) may be most important to address through public health intervention. For instance, findings suggested that obese young adults may be especially in need of interventions to help them achieve weight loss and improve PA habits. Future studies might improve PA levels by capitalizing on motivation to lose weight and targeting weight loss interventions to the specific needs of young adults. Given that subgroup 7 was younger on average relative to other subgroups, health messages that educate normal weight young adults about their risks of getting cancer and emphasize PA as a way to prevent some cancers might be persuasive in encouraging PA among those in emerging young adulthood (usually defined as 18–25 years (Aarnett, 2000)). Subgroup 6 consisted of individuals most likely to have smoked 100 cigarettes in their lifetime, suggesting that smoking cessation interventions be considered in conjunction with promoting PA in young adults. Indeed, a recent systematic review concluded that more trials of exercise interventions for smoking cessation are necessary (Ussher, Taylor, & Faulkner, 2012).

While these findings can inform the development of targeted PA interventions for young adults, the cross-sectional HINTS survey limited the examination of longitudinal and causal associations between variables. All measures were self-reported, which may have led to over- or under-reporting and biased estimates as a result of social desirability, poor recall and other potential biases. The use of self-reported PA questionnaires is associated with measurement errors, as respondents may overestimate vigorous PA and underestimate habitual activities (Ainsworth, 2009), although validity of PA questionnaire measurement may be higher among younger adults (Ferrari, Friedenreich, & Matthews, 2007). While we employed a more conservative classification of meeting PA guidelines that is consistent with cutpoints used in previous HINTS 2007 analyses (Oh et al., 2010; Wang & Coups, 2010), it should be noted that participants reporting 75–149 minutes of PA (19.6% of sample) may have been meeting vigorous PA guidelines but misclassified as not meeting PA recommendations, potentially underestimating the proportion of sufficiently active participants. However, given that the proportion of high PA young adults in this study

(37.8%) was greater than the 7.0%-10.8% of 20–39 year-olds meeting guidelines according to accelerometry, but lower than the 55.8%-74.0% classified as meeting PA recommendations by self-report measures (Centers for Disease Control and Prevention, 2008; Tucker et al., 2011), we would not expect this potential misclassification to influence the relationships between the correlates and PA outcomes and our conclusions. The differences between self-reported and objective measures highlight the need for more objective studies of PA among young adults. Another study limitation was the lack of measures for other correlates of PA behaviors, including environmental determinants (e.g., availability of PA facilities) and attention to media channels (e.g., hours watching television), as the 2007 HINTS did not include such measures. Since the SDA were conducted without using sampling weights, the possibility of subgroup misclassification due to underestimated standard errors cannot be eliminated.

Despite these limitations, understanding the unique characteristics and high-order variable interactions of these low PA subgroups is useful for informing audience segmentation of young adults into groups requiring attention. While logistic regression methods can be applied to distinguish groups at risk for low PA, SDA are potentially more informative for developing targeted interventions, because they identify groups of individuals that are homogenous in not only the binary outcome, but also in indicator variables (Kiernan, Kraemer, Winkleby, King, & Taylor, 2001). Another study strength was the non-parametric SDA approach, which is not based on the assumptions of normal distributions and linear relationships between variables (Kraemer, 1992). Furthermore, SDA were less impacted by missing data and multicollinearity among independent variables (Kraemer, 1992). Split-sample validation and use of a dataset with cognitively-tested and validated measures were additional study strengths. To date, SDA characterizing PA subgroups have focused neither on meeting national PA recommendations as an outcome nor young adults as a specific age group. Whereas previous HINTS studies have focused on awareness of PA and its role in cancer prevention, this study was unique in including measures of new media use (e.g., social networking sites) and its focus on PA in young adults. Given the importance of PA for preventing weight gain in young adulthood and decreasing risk of future chronic disease, these findings add to the emerging research on behavioral interventions for young adults.

Our study is the first, of which we are aware, to classify subgroups of PA in young adults by health communication-related behaviors and suggests some important implications for reaching young adults using various media. Interestingly, there were no significant differences among the eight subgroups in reported use of social networking sites—overall, half of young adults had used them. Recent estimates indicate that 87% of online young adults ages 18–29 use social networking sites, with 64% of 18–34 year-olds using them once to several times a day (Rainie, Lenhart, & Smith, 2012). These trends and results suggest that testing interventions delivered through social media, and understanding the characteristics of young adults that do better with specific health communication channels may be warranted.

Results of this exploratory study can inform hypothesis generation, suggest potential intervention communication channels, and guide the future development of targeted interventions for young adults. Further research should examine PA intervention strategies

that appeal to the distinguishing characteristics and unmet needs in the identified subgroups of PA in young adults.

Acknowledgments

The authors would like to acknowledge Dr. Dianne Ward for her helpful comments during the development of this manuscript. This study was supported by the UNC Lineberger Cancer Control Education Program (NIH/NCI funded R25 CA057726).

References

Adolescent and Young Adult Oncology Progress Review Group. Closing the gap: Research and care imperatives for adolescents and young adults with cancer. (NIH Publication No. 06-6067). Bethesda, MD: US Department of Health and Human Services, National Cancer Institute; 2006.

Aarnett JJ. Emerging adulthood - A theory of development from the late teens through the twenties. American Psychology. 2000; 55(5):469–480.

Ainsworth BE. How do I measure physical activity in my patients? Questionnaires and objective methods. British Journal of Sports Medicine. 2009; 43:6–9. [PubMed: 18718977]

Atienza AA, Yaroch AL, Mãsse LC, Moser RP, Hesse BW, King AC. Identifying sedentary subgroups the national cancer Institute's health information national trends survey. American Journal of Preventive Medicine. 2006; 31(5):383–390. [PubMed: 17046409]

Bennett GG, Wolin KY, Puleo EM, Mâsse LC, Atienza AA. Awareness of national physical activity recommendations for health promotion among US adults. Medicine & Science in Sports & Exercise. 2009; 41(10):1849–1855. [PubMed: 19727030]

Bernhardt JM, Chaney DJ, Chaney BH, Hall AK. New media for health education: a revolution in progress. Health Education & Behavior. 2013; 40(2):129–132. [PubMed: 23548787]

Cantor, D.; Coa, K.; Crystal-Mansour, S.; Davis, T.; Dipko, S.; Sigman, R. Health Information National Trends Survey (HINTS) 2007 final report. Rockville, MD: Westat; 2009. Retrieved from http://hints.cancer.gov/docs/HINTS2007FinalReport.pdf

Carnethon MR, Loria CM, Hill JO, Sidney S, Savage PJ, Liu K. Risk factors for the metabolic syndrome: the coronary artery risk development in young adults (CARDIA) study, 1985–2001. Diabetes Care. 2004; 27(11):2707–2715. [PubMed: 15505009]

Centers for Disease Control and Prevention. Prevalence of self-reported physically active adults – United States, 2007. Morbidity and Mortality Weekly Report. 2008; 57(48):1297–1300. [PubMed: 19052527]

Coups EJ, Ayorkor G, Orleans CT. Physician screening for multiple behavioral health risk factors. American Journal of Preventive Medicine. 2004; 27(2S):34–41. [PubMed: 15275672]

Coups EJ, Hay J, Ford JS. Awareness of the role of physical activity in colon cancer prevention. Patient Education and Counseling. 2008; 72:246–251. [PubMed: 18455355]

Crutzen R, de Nooijer J, Brouwer W, Oenema A, Brug J, de Vries NK. Strategies to facilitate exposure to internet-delivered health behavior change interventions aimed at adolescents or young adults: a systematic review. Health Education and Behavior. 2011; 38(1):49–62. [PubMed: 21189422]

Davis RE, Resnicow K, Atienza AA, Peterson KE, Domas A, Hunt A, et al. Use of signal detection methodology to identify subgroups of dietary supplement use in diverse populations. Journal of Nutrition. 2008; 13(1):205S–211S. [PubMed: 18156426]

Department of Veteran Affairs. Signal detection software for receiver operator characteristics. ROC4 [Computer software]. 2002. Retrieved from http://www.stanford.edu/~yesavage/ROC.html

Dobransky K, Hargittai E. Inquiring minds acquiring wellness: Uses of online and offline sources for health information. Health Communication. 2012; 27(4):331–343. [PubMed: 21932982]

Dowda M, Ainsworth BE, Addy CL, Saunders R, Riner W. Correlates of physical activity among U.S. young adults, 18 to 30 years of age, from NHANES III. Annals of Behavioral Medicine. 2003; 26(1):15–23. [PubMed: 12867350]

Eliassen AH, Colditz GA, Rosner B, Willett WC, Hankinson SE. Adult weight change and risk of postmenopausal breast cancer. JAMA: The Journal of the American Medical Association. 2006; 296(2):193–201. [PubMed: 16835425]

Ferrari P, Friedenreich C, Matthews CE. The role of measurement error in estimating levels of physical activity. American Journal Epidemiology. 2007; 166:832–840.

Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA: The Journal of the American Medical Association, 30. 2010; 3(3):235–241.

Gokee LaRose J, Tate DF, Gorin AA, Wing RR. Preventing weight gain in young adults: A randomized controlled pilot study. American Journal of Preventive Medicine. 2010; 9(1):63–68. [PubMed: 20537843]

Gokee-LaRose J, Gorin AA, Raynor HA, Laska MN, Jeffery RW, Levy R, et al. Are standard behavioral weight loss programs effective for young adults? International Journal of Obesity. 2009; 3(12):1374–1380. [PubMed: 19786967]

Gorman, A. Cancer's most isolated patients. Los Angeles Times, Col. One. 2011 Oct 26. Retrieved from http://articles.latimes.com/print/2011/oct/26/local/la-me-youngadult-cancer-20111026

Hankinson AL, Daviglus ML, Bouchard C, Carnethon M, Lewis CE, Schreiner PJ, Liu K, Sidney S. Maintaining a high physical activity level over 20 years and weight gain. JAMA: The Journal of the American Medical Association. 2010; 304(23):2603–2610. [PubMed: 21156948]

Hawkins NA, Berkowitz Z, Peipins LA. What does the public know about preventing cancer? Results from the Health Information National Trends Survey (HINTS). Health Education Behavior. 2010; 37(4):490–503. [PubMed: 17478600]

Hay J, Coups E, Ford J. Predictors of perceived risk for colon cancer in a national probability sample in the United States. Journal of Health Communication. 2006; 11(Suppl 1):71–92. [PubMed: 16641075]

Heath GW, Parra DC, Sarmiento OL, Andersen LB, Owen N, Goenka S, Montes F, Brownson R. Evidence-based intervention in physical activity: lessons from around the world. Lancet. 2012; 380:272–281. [PubMed: 22818939]

Hebden L, Chey T, Allman-Farinelli M. Lifestyle intervention for preventing weight gain in young adults: a systematic review and meta-analysis of RCTs. Obesity Reviews. 2012; 13:692–710. [PubMed: 22413804]

Hesse BW, Nelson DE, Kreps GL, Croyle RT, Arora NK, Rimer BK, et al. Trust and sources of health information the impact of the internet and its implications for health care providers: Findings from the first Health Information National Trends Survey. Archives of Internal Medicine. 2005; 165(22):2618–2624. [PubMed: 16344419]

Hesse BW, Arora NK, Beckjord EB, Finney Rutten LJF. Information support for cancer survivors. Cancer. 2008; 2(11 Suppl):2529–2540. [PubMed: 18428201]

Honda K, Neugut AI. Associations between perceived cancer risk and established risk factors in a national community sample. Cancer Detection and Prevention. 2004; 8(1):1–7. [PubMed: 15041071]

Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, et al. The effectiveness of interventions to increase physical activity. A systematic review. American Journal of Preventive Medicine. 2002; 2(4S1):73–107. [PubMed: 11985936]

Kiernan M, Kraemer HC, Winkleby MA, King AC, Taylor CB. Do logistic regression and signal detection identify different subgroups at risk? Implications for the design of tailored interventions. Psychological Methods. 2001; 6(1):35–48. [PubMed: 11285811]

King AC, Goldberg JH, Salmon J, Owen N, Dunstan D, Weber D, et al. Identifying subgroups of US adults at risk for prolonged television viewing to inform program development. American Journal of Preventive Medicine. 2010; 8(1):17–26. [PubMed: 20117553]

King AC, Kiernan M, Oman RF, Kraemer HC, Hull M, Ahn D. Can we identify who will adhere to long-term physical activity? Signal detection methodology as a potential aid to clinical decision making. Health Psychology. 1997; 6:380–389. [PubMed: 9237091]

King AC, Marcus B, Ahn D, Dunn AL, Rejeski WJ, Sallis JF, et al. Identifying subgroups that succeed or fail with three levels of physical activity intervention: The activity counseling trial. Health Psychology. 2006; 5(3):336. [PubMed: 16719605]

Kraemer, HC. Evaluating medical tests: Objective and quantitative guidelines. Newbury Park, CA: Sage Publications; 1992.

Kushi LH, Doyle C, McCullough M, Rock CL, Demark-Wahnefried W, Bandera EV, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention. CA: A Cancer Journal for Clinicians. 2012; 2(1):30–67. [PubMed: 22237782]

LaPlante C, Peng W. A systematic review of e-health interventions for physical activity: An analysis of study design, intervention characteristics, and outcomes. Telemedicine and e-Health. 2011; 17(7): 509–523. [PubMed: 21718092]

Lippke S, Nigg CR, Maddock JE. Health-promoting and health-risk behaviors: theory-driven analyses of multiple health behavior change in three international samples. International Journal of Behavioral Medicine. 2012; 19:1–13. [PubMed: 21234735]

Lu L, Risch H, Irwin ML, Mayne ST, Cartmel B, Schwartz P, Rutherford T, Yu H. Long-term overweight and weight gain in early adulthood in association with risk of endometrial cancer. International Journal of Cancer. 2011; 129:1237–1243. [PubMed: 21387312]

Malhotra R, Ostbye T, Riley CM, Finkelstein E. Young adult weight trajectories through midlife by body mass category. Obesity. 2013 [Epub ahead of print].

Marcus PM, Huang GC, Beck V, Miller MJ. The impact of a primetime cancer storyline: From individual knowledge and behavioral intentions to policy-level changes. Journal of Cancer Education. 2010; 5(4):484–489. [PubMed: 20300910]

Murphy, S.; Hether, H.; Rideout, V. How healthy is prime time? An analysis of health content in popular prime time television programs. Menlo Park, CA: Henry J. Kaiser Family Foundation and USC Annenberg Norman Lear Center's Hollywood, Health & Society; 2008.

Norman J, Bild D, Lewis C, Liu K, West DS. The impact of weight change on cardiovascular disease risk factors in young black and white adults: The CARDIA study. International Journal of Obesity. 2003; 7(3):369–376. [PubMed: 12629565]

Oh A, Shaikh A, Waters E, Atienza A, Moser RP, Perna F. Health disparities in awareness of physical activity and cancer prevention: findings from the National Cancer Institute's 2007 Health Information National Trends Survey (HINTS). Journal of Health Communication. 2010; 15:60–77. [PubMed: 21154084]

Parrott MW, Tennant LK, Olejnik S, Poudevigne MS. Theory of planned behavior: Implications for an email-based physical activity intervention. Psychology of Sport and Exercise. 2008; 9(4):511–526.

Physical Activity Guidelines Advisory Committee (PAGAC). Physical activity guidelines advisory committee report. Washington, DC: US Department of Health and Human Services; 2008.

Plotnikoff RC, Johnson ST, Karunamuni N, Boule NG. Physical activity related information sources predict physical activity behaviors in adults with type 2 diabetes. Journal of Health Communication, 1. 2010; 5(8):846–858.

Rainie, L.; Lenhart, A.; Smith, A. The tone of life on social networking sites. Washington, DC: Pew Internet & American Life Project; 2012. Retrieved from http://pewinternet.org/Reports/2012/Social-networking-climate.aspx

Rice RE. Influences, usage, and outcomes of Internet health information searching: Multivariate results from the Pew surveys. International Journal of Medical Informatics. 2006; 75:8–28. [PubMed: 16125453]

Rizzo, L.; Moser, RP.; Waldron, W.; Wang, Z.; Davis, WW. Analytic methods to examine changes across years using HINTS 2003 & 2005 data. (NIH Publication No. 08-6435). Bethesda, MD: US Department of Health and Human Services; 2008.

Rovniak LS, Anderson ES, Winett RA, Stephens RS. Social cognitive determinants of physical activity in young adults: a prospective structural equation analysis. Annals of Behavioral Medicine. 2002; 24:149–156. [PubMed: 12054320]

Shim M, Kelly B, Hornik R. Cancer information scanning and seeking behavior is associated with knowledge, lifestyle choices, and screening. Journal of Health Communication. 2006; 11(Suppl 1): 157–172. [PubMed: 16641081]

Sullivan HW, Rutten LJF. Cancer prevention information seeking: A signal detection analysis of data from the Cancer Information Service. Journal of Health Communication. 2009; 4(8):785–796. [PubMed: 20029711]

Trost SG, Owen N, Bauman AE, Sallis JF, Brown W. Correlates of adults' participation in physical activity: Review and update. Medicine & Science in Sports & Exercise. 2002; 4(12):1996–2001. [PubMed: 12471307]

Truesdale K, Stevens J, Lewis C, Schreiner P, Loria C, Cai J. Changes in risk factors for cardiovascular disease by baseline weight status in young adults who maintain or gain weight over 15 years: The CARDIA study. International Journal of Obesity. 2006; 30(9):1397–1407. [PubMed: 16534519]

Tucker JM, Welk GJ, Beyler NK. Physical activity in US adults: Compliance with the physical activity guidelines for Americans. American Journal of Preventive Medicine. 2011; 40(4):454–461. [PubMed: 21406280]

Ussher M, Taylor AH, Faulkner G. Exercise interventions for smoking cessation. Cochrane Database of Systematic Reviews. 2012; 1:CD002295. [PubMed: 22258948]

Vandelanotte C, Spathonis KM, Eakin EG, Owen N. Website-delivered physical activity interventions: A review of the literature. American Journal of Preventive Medicine. 2007; 33(1):54–64. [PubMed: 17572313]

VanKim NA, Laska MN, Ehlinger E, Lust K, Story M. Understanding young adult physical activity, alcohol and tobacco use in community colleges and 4-year post-secondary institutions: A cross-sectional analysis of epidemiological surveillance data. BMC Public Health. 2010; 10:208–216. [PubMed: 20420678]

Wang C, Coups EJ. Causal beliefs about obesity and associated health behaviors: results from a population-based survey. International Journal of Behavioral Nutrition and Physical Activity. 2010; 7:19. [PubMed: 20199677]

Wendel-Vos W, Droomers M, Kremers S, Brug J, Van Lenthe F. Potential environmental determinants of physical activity in adults: A systematic review. Obesity Reviews. 2007; 8(5):425–440. [PubMed: 17716300]

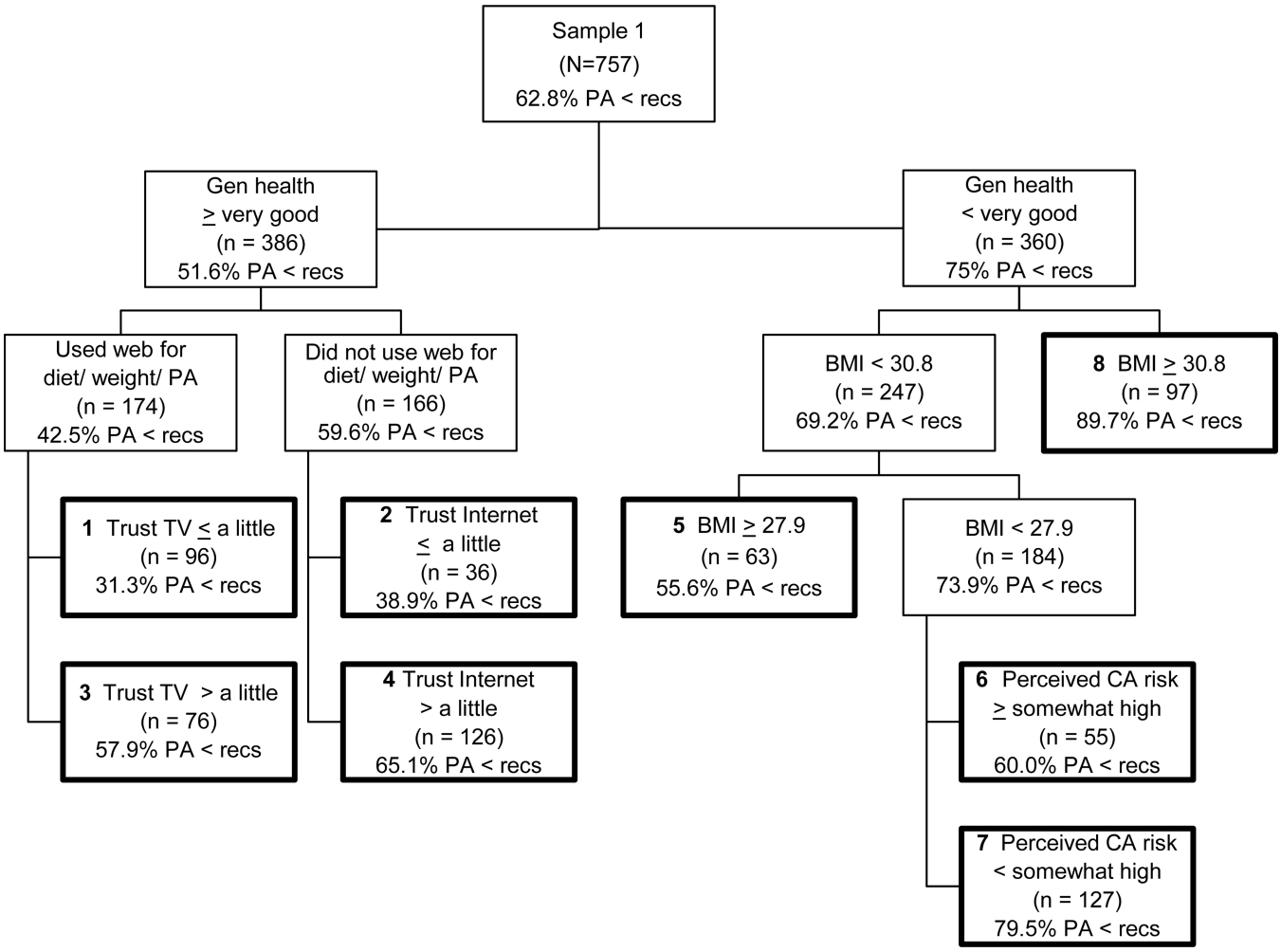

Figure 1.

Signal detection analysis for young adults not meeting physical activity recommendations in exploratory sample. PA = physical activity; PA < recs = not meeting physical activity recommendations; Gen = general; BMI = body mass index; CA = cancer.

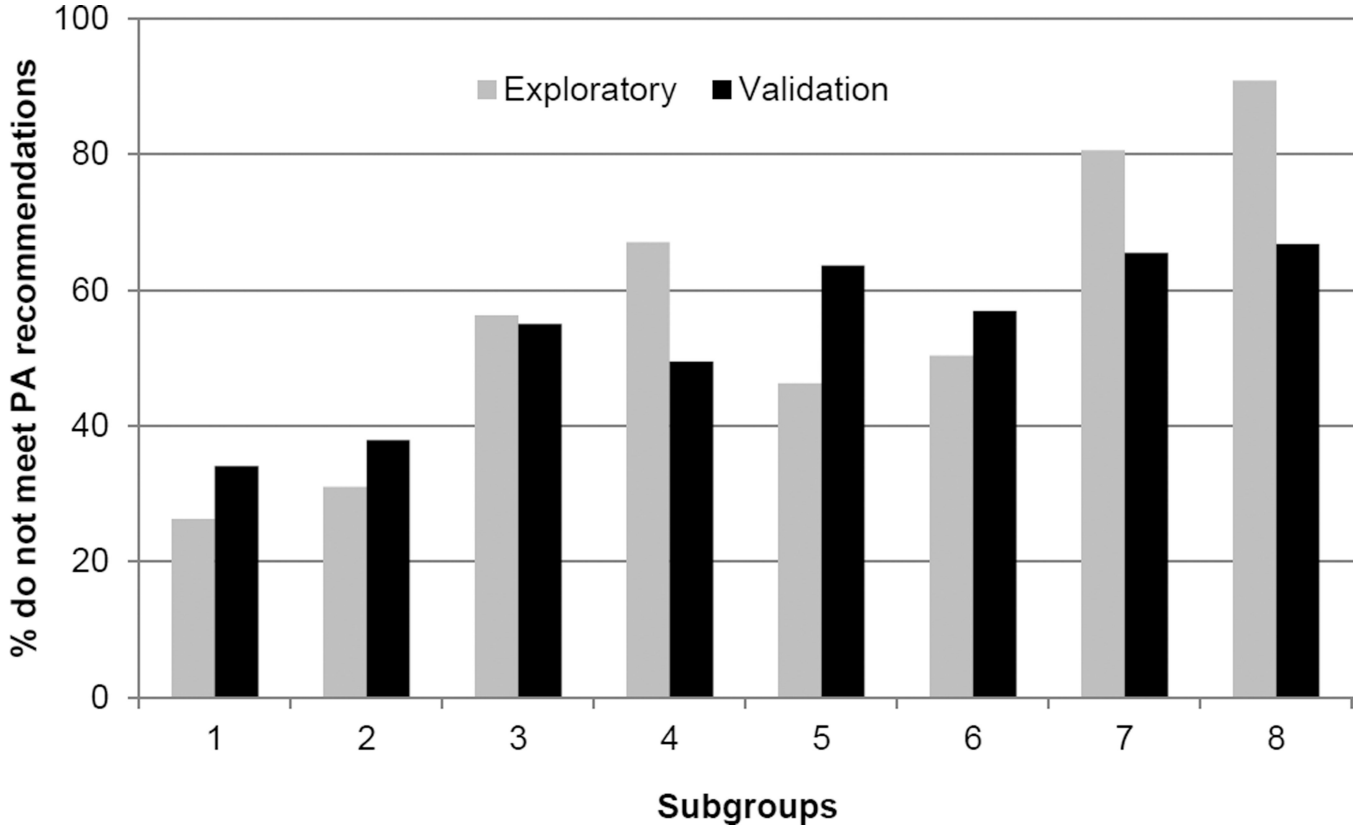

Figure 2.

Stability of % of young adults not meeting physical activity recommendations in exploratory sample (n=757) versus validation sample (n=770) (weighted data). Cochran-Mantel-Haenszel test=0.81, p=0.37. DWP = diet, weight or physical activity; TV = television; BMI = body mass index; CA = cancer. Subgroups:

1) general health ≥ very good, Use DWP web, Low TV trust;
2) general health ≥ very good, No DWP web, Low web trust;
3) general health ≥ very good, Use DWP web, Trust TV;
4) general health ≥ very good, No DWP web, Trust web;
5) general health < very good, BMI≥27.9;
6) general health < very good, BMI<27.9, High CA risk;
7) general health < very good, BMI<27.9, Low CA risk;
8) general health < very good, BMI≥30.8.

J Health Commun. Author manuscript; available in PMC 2016 May 02.

Table 1

Descriptive Statistics for Young Adults Sample from HINTS 2007 (Unweighted Data)

			Meets PA recommendations		
Characteristics	**n**	**Full sample (n = 1527) % or M (SD)**	**No (n = 949) % or M (SD)**	**Yes (n = 578) % or M (SD)**	**Bivariate significance level**
Does not meet PA recommendations	1527	62.2	_	_	_
Any exercise during past month (yes)	1527	73.0	56.5	100	$p<0.0001$
Sociodemographics					
Age (years)	1527	30.2 (6.2)	30.4 (6.1)	29.8 (6.4)	$p<0.05$
Gender (female)	1527	65.0	68.0	60.2	$p<0.005$
Race/ethnicity (white)	1475	64.2	60.9	69.6	$p<0.005$
Education[a]	1496	3.0 (1.0)	3.0 (1.0)	3.1 (1.0)	$p<0.05$
Annual income[b]	1387	3.3 (1.5)	3.3 (1.5)	3.5 (1.5)	$p<0.005$
Employed	1497	65.9	66.6	64.8	NS
Married or living as married	1495	53.6	55.7	50.2	$p<0.05$
Health					
Body mass index	1467	26.8 (6.5)	27.5 (7.1)	25.7 (5.3)	$p<0.0001$
General health[c]	1499	2.5 (0.9)	2.7 (0.9)	2.3(0.9)	$p<0.0001$
Health insurance (yes)	1508	79.4	77.4	82.8	$p<0.05$
Regular provider (yes)	1521	62.6	62.4	62.9	NS
Ever had cancer (yes)	1499	2.4	2.2	2.8	NS
Family member ever had cancer (yes)	1457	70.4	69.2	72.4	NS
Health beliefs and behaviors					
Believes exercise lowers cancer risk	1517	62.4	60.1	66.0	$p<0.05$
Knows PA recs ≥150 min/week	1439	58.6	56.1	62.7	$p<0.05$
Knows daily FV intake recs	1513	38.1	37.0	39.8	NS
Eats ≥5 FVs per day	1513	35.6	30.6	43.6	$p<0.0001$
Smoked ≥ 100 cigarettes in entire life	1511	36.9	35.4	39.3	NS
Perceived cancer risk[d]	1480	2.7 (1.1)	2.7 (1.1)	2.7 (1.1)	NS
Cancer-related worry[e]	1504	1.7 (0.8)	1.7 (0.8)	1.6 (0.8)	NS

Characteristics	n	Full sample (n = 1527) % or M (SD)	Meets PA recommendations: No (n = 949) % or M (SD)	Meets PA recommendations: Yes (n = 578) % or M (SD)	Bivariate significance level
Health-related self-efficacy[f]	1515	2.1(0.9)	2.2 (0.9)	2.0(0.8)	$p<0.0001$
Health information seeking					
Ever looked for health information	1524	76.2	74.1	79.6	$p<0.05$
Seek health information from Internet 1st	1154	75.5	76.9	73.2	NS
Information seeking experiences scale[g]	1157	2.9 (0.8)	2.9 (0.8)	3.0 (0.7)	$p<0.05$
Information seeking self-efficacy[f]	1520	2.2(1.0)	2.3(1.0)	2.1(1.0)	$p<0.005$
Internet use (past 12 months)					
Ever accessed Internet	1527	84.9	83.8	86.9	NS
Bought medicine or vitamins on-line	1295	11.6	10.3	13.6	NS
Participated in online support group	1295	6.0	6.3	5.4	NS
Communicated with doctor or doctor's office	1295	16.1	14.5	18.8	$p<0.05$
Used website to help with diet, weight/PA	1294	44.4	41.1	49.6	$p<0.005$
Looked for healthcare provider	1294	45.8	47.7	42.9	NS
Downloaded to portable device	1295	43.1	40.3	47.5	$p<0.05$
Visited a "social networking" site	1295	50.2	51.0	49.1	NS
Wrote in an online diary or "blog"	1295	15.4	14.7	16.6	NS
Kept track of personal health information	1295	14.8	14.5	15.4	NS
Trust in information sources[h]					
Doctor/ health care professional	1520	1.3 (0.6)	1.3 (0.6)	1.3 (0.6)	NS
Family/ friends	1518	2.2 (0.8)	2.2 (0.8)	2.3 (0.7)	NS
Newspapers/ magazines	1511	2.5 (0.8)	2.5 (0.8)	2.5 (0.8)	NS
Radio	1497	2.8 (0.8)	2.8 (0.8)	2.9 (0.8)	NS
Internet	1497	2.1 (0.8)	2.1 (0.8)	2.1 (0.7)	NS
Television	1512	2.7 (0.8)	2.6 (0.8)	2.7 (0.8)	$p<0.01$
Government health agencies	1500	1.8 (0.8)	1.8 (0.8)	1.8 (0.8)	NS
Charitable organizations	1494	2.4 (0.8)	2.4 (0.8)	2.4 (0.8)	NS
Religious leaders and organizations	1504	2.8 (0.9)	2.8 (0.9)	2.9 (0.9)	$p<0.05$

Note. PA = physical activity; FV = fruit and vegetable; recs = recommendations.

[a] 1 = less than high school, 2 = high school graduate, 3 = some college, 4 = college graduate.

[b] 1 = <$20,000, 2 = $20,000 to <$50,000, 3 = $50,000 to <$75,000, 4 = ≥$75,000.

[c] 1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor.

[d] 1 = very low, 2 = somewhat low, 3 = moderate, 4 = somewhat high, 5 = very high.

[e] 1 = rarely or never, 2 = sometimes, 3 = often, 4 = all the time.

[f] 1 = completely confident, 2 = very confident, 3 = somewhat confident, 4 = a little confident, 5 = not confident at all.

[g] 1 = strongly agree, 2 = somewhat agree, 3 = somewhat disagree, 4 = strongly disagree.

[h] 1 = a lot, 2 = some, 3 = a little, 4 = not at all.

Table 2

Characteristics of Identified Subgroups of Young Adults in Full Sample (Weighted Data)

	Lowest percentage meet PA recs							Highest percentage meet PA recs
	General health ≥ very good				General health < very good			
	1	2	3	4	5	6	7	8
Characteristics	**Use DWP web Low TV trust**	**No DWP web Low web trust**	**Use DWP web Trust TV**	**No DWP web Trust web**	**BMI≥27.9**	**BMI<27.9 High CA risk**	**BMI<27.9 Low CA risk**	**BMI≥30.8**
n	**173**	**80**	**143**	**271**	**120**	**101**	**259**	**213**
	% or M	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**
Does not meet PA recs	29.8	34.4	55.6	56.9	53.7	53.1	73.2	77.3
Sociodemographics								
Age (years) **	27.6	27.1	29.5	28.0	29.1	30.0	27.0	30.8
Gender (female)	45.7	50.1	60.1	47.9	33.3	60.2	49.5	57.2
Race/ethnicity (white) **	83.2	57.9	56.9	75.2	52.4	79.3	52.7	58.1
Education[a] **	3.3	2.7	3.0	3.0	2.5	2.7	2.6	2.4
Annual income[b] *	2.8	3.0	3.0	2.9	2.3	2.6	2.3	2.4
Employed (yes)	69.0	64.7	72.8	54.5	69.1	64.9	60.2	63.1
Married or living as married	45.9	37.3	54.1	45.1	41.2	44.6	44.4	52.8
Health								
Body mass index **	24.5	24.8	26.7	24.8	29.3	23.3	23.1	36.7
General health[c] **	1.8	1.8	1.7	1.8	3.3	3.3	3.2	3.4
Health insurance (yes)	90.1	72.3	88.2	84.8	67.8	69.4	69.6	72.8
Regular provider (yes)	59.0	59.4	69.5	61.7	50.5	60.3	48.1	63.2
Ever had cancer (yes)	0.3	0.6	0.7	0.5	1.4	4.2	0.4	2.5
Family member ever had cancer (yes) *	78.5	76.1	63.5	65.4	57.6	89.2	62.9	73.2

	Lowest percentage meet PA recs						Highest percentage meet PA recs	
	General health ≥ very good				General health < very good			
	1	2	3	4	5	6	7	8
Characteristics	**Use DWP web Low TV trust**	**No DWP web Low web trust**	**Use DWP web Trust TV**	**No DWP web Trust web**	**BMI≥27.9**	**BMI<27.9 High CA risk**	**BMI<27.9 Low CA risk**	**BMI≥30.8**
n	**173**	**80**	**143**	**271**	**120**	**101**	**259**	**213**
	% or M	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**
Health beliefs and behaviors								
Believes exercise lowers cancer risk	70.0	59.1	66.9	69.7	59.3	55.6	56.2	55.9
Knows PA recs ≥150 min/week	56.5	60.0	58.9	63.5	51.4	60.1	58.2	64.6
Knows daily FV intake recs *	54.5	27.1	43.8	38.3	21.3	33.1	24.3	32.4
Eats ≥5 FVs per day *	52.1	30.8	45.6	37.8	27.8	18.2	29.7	28.2
Smoked ≥100 cigarettes in entire life **	30.0	39.8	32.4	32.3	58.0	71.7	41.0	43.5
Perceived cancer risk[d] **	2.5	2.4	2.5	2.6	2.8	4.2	2.4	3.1
Cancer-related worry[e] **	1.6	1.4	1.6	1.5	1.7	2.1	1.6	1.9
Health-related self-efficacy[f] **	1.8	1.8	1.8	1.9	2.7	2.6	2.4	2.6
Health information seeking								
Ever looked for health information *	87.9	49.7	92.8	72.1	56.6	77.7	71.2	72.7
Seek health information from Internet 1st	72.2	64.6	76.9	83.9	65.6	74.0	78.6	75.3
Information seeking experiences scale[g] **	3.0	2.7	3.2	3.0	2.5	2.8	2.7	2.7

	Lowest percentage meet PA recs						Highest percentage meet PA recs	
	General health ≥ very good				General health < very good			
	1	2	3	4	5	6	7	8
Characteristics	**Use DWP web Low TV trust**	**No DWP web Low web trust**	**Use DWP web Trust TV**	**No DWP web Trust web**	**BMI≥27.9**	**BMI<27.9 High CA risk**	**BMI<27.9 Low CA risk**	**BMI≥30.8**
n	**173**	**80**	**143**	**271**	**120**	**101**	**259**	**213**
	% or M	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**
Information seeking self-efficacy[f] **	2.0	2.3	1.8	2.0	3.1	2.3	2.3	2.4
Internet use (past 12 months)								
Ever accessed Internet **	100	100	100	100	73.8	86.7	78.9	81.3
Bought medicine or vitamins online	17.2	5.4	14.4	6.7	9.8	10.7	12.2	7.1
Participated in online support group **	4.5	1.1	2.0	5.3	7.8	6.1	6.7	9.2
Communicated with doctor or doctor's office	16.5	9.8	23.7	11.3	9.6	16.4	17.5	9.8
Used website to help with DWP *	100	0	100	0	39.2	40.5	31.2	47.5
Looked for healthcare provider *	55.5	24.3	56.7	31.7	32.6	46.2	38.6	47.4
Downloaded to portable device	61.6	46.0	52.0	50.4	52.0	35.1	39.7	43.1
Visited a "social networking" site	65.3	48.6	64.1	45.3	50.7	50.0	58.9	59.9
Wrote in an online diary or "blog"	21.0	17.3	24.5	11.9	15.2	11.3	12.0	21.6
Kept track of personal health information	13.2	7.5	27.0	9.6	16.5	8.2	13.6	10.5
Trust in information sources[h]								

	Lowest percentage meet PA recs							Highest percentage meet PA recs
	General health ≥ very good				General health < very good			
	1	2	3	4	5	6	7	8
Characteristics	**Use DWP web Low TV trust**	**No DWP web Low web trust**	**Use DWP web Trust TV**	**No DWP web Trust web**	**BMI≥27.9**	**BMI<27.9 High CA risk**	**BMI<27.9 Low CA risk**	**BMI≥30.8**
n	**173**	**80**	**143**	**271**	**120**	**101**	**259**	**213**
	% or M	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**	**% or M**
Doctor/ health care professional	1.3	1.4	1.2	1.2	1.5	1.3	1.3	1.4
Family/ friends	2.3	2.1	2.2	2.2	2.4	2.3	2.1	2.3
Newspapers/ magazines *	2.7	2.8	2.2	2.4	2.6	2.5	2.5	2.5
Radio *	3.2	3.1	2.6	2.7	2.8	2.8	2.9	2.8
Internet **	2.2	3.1	1.7	1.8	2.2	2.2	2.2	2.1
Television **	3.2	3.0	1.9	2.6	2.7	2.7	2.6	2.6
Government health agencies **	2.0	2.2	1.5	1.7	2.0	1.9	1.9	1.8
Charitable organizations **	2.7	2.7	2.1	2.3	2.4	2.5	2.3	2.5
Religious leaders and organizations **	3.2	3.0	2.5	2.8	2.8	3.0	2.7	2.9

Note. Bolded variables indicate characteristics that significantly differentiate all groups in signal detection analyses. DWP = diet, weight or physical activity; BMI = body mass index; CA = cancer; PA = physical activity; recs = recommendations; FV = fruit and vegetable.

[a] 1= less than high school, 2 = high school graduate, 3 = some college, 4 = college graduate.

[b] 1 = <$20,000, 2 = $20,000 to <$50,000, 3 = $50,000 to <$75,000, 4 = ≥$75,000.

[c] 1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor.

[d] 1 = very low, 2 = somewhat low, 3 = moderate, 4 = somewhat high, 5 = very high.

[e] 1 = rarely or never, 2 = sometimes, 3 = often, 4 = all the time.

[f] 1 = completely confident, 2 = very confident, 3 = somewhat confident, 4 = a little confident, 5 = not confident at all.

[g] 1 = strongly agree, 2 = somewhat agree, 3 = somewhat disagree, 4 = strongly disagree.

[h] 1 = a lot, 2 = some, 3 = a little, 4 = not at all.

[*] Differences among all groups using chi-square or ANOVA tests of homogeneity are statistically significant at $p \leq 0.005$.

[**] Differences among all groups using chi-square or ANOVA tests of homogeneity are statistically significant at $p \leq 0.0001$.