

“Are you still watching?”: Correlations between binge TV watching, diet and physical activity

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Abstract

Sedentary behavior can increase risk of chronic disease. Online streaming of television (TV) has increased in popularity, yet may increase a sedentary lifestyle among young adults. This study investigated self-reported demographic characteristics and obesogenic behaviors among college students who reported binge watching TV and those who did not. Five hundred young adults were randomly-sampled from a western public university in the United States in October 2015. Participants reported demographic information, health related details, and whether they binge watched TV weekly, monthly, or not at all through an online survey. Almost one-quarter of participant reported binge TV watching weekly and 72% did so monthly. Females had higher odds of binge TV watching (weekly and monthly) than males. Participants who reported eating out weekly had higher odds of weekly TV binge watching. Participants who were upperclassmen and did not consume fruit daily had higher odds of monthly TV binge watching. No relationship between self-reported Body Mass Index and TV binge watching was identified. TV binge watching is an understudied area that warrants more health research attention. These results identify the importance of reducing sedentary time activities among young adults, including binge TV watching, in order to prevent chronic disease in the future.

Keywords: Binge Watching, College, Television, health; Diet, Physical Activity

INTRODUCTION

Young adulthood is a time marked by transition, increased autonomy, and regular media use (Coyne et al., 2013). With these notable markers, it has been proposed that young adulthood is an important time period for the development of enduring health behaviors (Nelson et al., 2008). Watching TV is one of the most prevalent sedentary behaviors (Winjndaele et al., 2011) and sedentary behavior is associated with increased risk for the top chronic diseases in the United States, including cardiovascular disease, cancer, and type 2 diabetes (Hu et al., 2001; Hu et al., 2003; Keadle et al., 2015). In the United States, the average American adult watches approximately four and half-hours of live television (TV) a day (The Nielsen Company, 2016).

Online, instant streaming platforms like Hulu, Amazon, and Netflix have changed the way many watch TV. Devices like laptops, smartphones, and tablets have made constant

access to online TV streaming a possibility. Almost all young adults report using the internet (96%) (Pew Research Center, 2015). Because of the accessibility of instant streaming through the internet, the concept of *binge TV watching* has emerged. Binge TV watching is referred to as the act of watching consecutive hours of media content in a single sitting or viewing multiple episodes of the same TV show in the same sitting (Walton-Pattison et al., 2016). Currently, no standard definition of binge TV watching has been established (De Feijter et al., 2016; Khan and Gisbergen, 2016; Jenner, 2016; Spangler, 2013; Walton-Pattison et al., 2016), yet the most commonly used definition of binge TV watching is between two and six episodes in one sitting (Walton-Pattison et al., 2016). Because episodes vary in length, this can equate to be anywhere from 45 minutes to six hours.

TV AND PHYSICAL INACTIVITY

While no research to date has specifically examined

binge TV watching and physical inactivity, a large body of research has examined TV watching and physical inactivity. Experts assert that the number of hours spent in front of the TV displaces the time spent in physical activity (DuRant et al., 1994). Additionally, watching TV also has a relationship with obesity. Several researchers have identified a positive relationship between the number of hours of TV watched and obesity in young adults (Boone et al., 2007; Boulos et al., 2012). Thus suggesting that binge TV watching may negatively influence physical activity levels and obesity as well.

TV AND EATING HABITS

Another large body of evidence has examined the relationship between TV watching and diet. A well-established link between TV watching and a decreased consumption of fruits and vegetables has been established (Boynton-Jarrett et al., 2003; Coon et al., 2001; Crespo et al., 2001; Liang et al., 2009). Other research has recognized a strong relationship between TV watching and other unhealthy diet behaviors including increased sugar sweetened beverage consumption (Barr-Anderson et al., 2009), increased overall food intake (Bellisle et al., 2004; Blass et al., 2006; Jackson et al., 2009; Stroebele and de Castro, 2004), consumption of snacks that are high in calories, and fast food consumption (Cleland et al., 2008). Some hypothesize that eating while watching TV may interrupt one's ability to respond to satiety cues (Wansink, 2010), thus contributing to one's ability to regulate the number of calories consumed.

PURPOSE OF THE CURRENT STUDY

Behaviors are best predicted through intention to perform a behavior, according to the theory of planned behavior (TPB) (Ajzen, 1975). Identity theory suggests that self-identity is a predictor to intention (Terry et al., 1999) and has been studied as a predictor to preform behavior for several decades. Researchers found that people were more likely to intend on engaging in a behavior if it was part of their self-identity for both health and non-health related behaviors (Charng et al., 1988; Granberg and Holmberg, 1990; Hagger et al., 2007; Sparks and Shepherd, 1992; Theodorakis, 1994). Therefore, there may be value in studying individuals who self-identify as binge TV watchers. According to identity theory and the TPB, individuals who self-identify as binge TV watcher are likely to spend hours of time in sedentary behavior each week and month, likely putting them at increased risk for the development of long-term chronic disease. Thus, identifying characteristics of young adults who are likely to self-identify as binge TV watchers may facilitate the development of targeted interventions to reduce time

spent in sedentary activities.

Further, no research to date has examined binge TV watching and its relationship to obesogenic behaviors in young adults. Identifying relationships between diet and physical activity and binge TV watching may help prevent serious chronic disease in the future. The purpose of this study was to examine the correlations between consumption of fruits and vegetables, physical activity, self-reported Body Mass Index (BMI), and binge TV watching within a sample of young adults. We hypothesized that individuals who binge watched TV would have poorer diets, be less physically active, and have higher BMI values than those who do not binge watch TV.

METHODS PROCEDURES AND SAMPLE

A random sample of young adults attending a university in northern Utah was determined by the university registrar's office. A total of 1,995 students were invited to participate in an online survey, administered through Qualtrics. The survey consisted of questions from several previous studies (Centers for Disease Control and Prevention, 2002; Kruger and Karmarkar; Lorig et al., 1996) and was reviewed by a panel of health and media experts from several universities. Survey questions included demographic characteristics, typical TV use, physical activity, nutrition, and BMI. Prior to taking the survey, all respondents were asked to complete an online consent form. All data collection instruments, procedures, and protocols were approved by institution's IRB.

MEASURES DEMOGRAPHIC VARIABLES

Respondents were asked to identify their race/ethnicity and were allowed to select more than one response option to classify their race/ethnicity. The majority of the sample selected Non-Hispanic, White; all other options, including those who selected multiple responses, were collapsed into other category to create a dichotomous variable. Participants were also asked to report their marital status and their responses were categorized as single or married.

BINGE TV WATCHING

Respondents were asked to identify how many consecutive hours of TV watching during one sitting they consider to be binge watching. Based on their description, respondents were asked if they binge watched in the last week and last month. These variables were used as the outcome variables for data analyses.

DIET

Several variables representing diet were examined. Respondents were asked to identify the number of times they ate or drank 100% pure fruit juice; fresh, frozen, or canned fruit; dark green vegetables; orange colored vegetables; and other vegetables in the last week. Seven response options were provided (i.e., I did not consume this food/drink in the past seven days, 1-3 times during the past 7 days, 4-6 times during the past 7 days, 1 time per day, 2 times per day, 3 times per day, and 4 or more times per day) and were collapsed into two categories: (a) less than once per day and (b) once or more per day for analysis. Respondents were also asked to report how frequently they eat out or get take out from a restaurant in a usual week (response options ranged from never to six or more times). Response options were collapsed to never, 1 time per week, 2-3 times per week, and 4 or more times per week.

PHYSICAL ACTIVITY

An established measure (Lorig et al., 1996) of total weekly time spent with different exercises was completed by respondents. Scoring following Stanford Patient Education Research Center (patienteducation.stanford.edu) was used to define number of minutes spent on each exercise activity (Lorig et al., 1996). Each activity was classified into “moderate activity” and “vigorous activity” as defined by the CDC and American College of Sports Medicine (ACSM) guidelines (US Department of Health and Human Services, 1999). Relying on the PA requirements as defined by ACSM and the American Heart Association (Haskell et al., 2007), minutes of activity for “moderate” and “vigorous” were summed and the coded as one if they met PA recommendations and zero if they did not meet recommendations as.

BODY MASS INDEX

BMI values were calculated using participant-reported measurements of height and weight in the formula (weight (lbs)/height (in)²) x 703. Two BMI variables were created; one capturing the previously established criteria for establishing obesity categories (Underweight= below 18.5; Normal/Healthy weight=18.5-24.9; Overweight=25.0-29.9; Obese=30.0 and above) (Centers for Disease Control and Prevention, 2015), while the other was a continuous variable.

ANALYSIS

Data analyses were conducted in SAS version 9.4. Descriptive statistics were calculated for each variable. To compare binge TV watchers to non-binge TV watchers, chi-square analysis and *t*-test analyses were used. For

hypothesis testing, two separate logistic regression models were built. The first model examined correlates of weekly binge TV watching, while the second model examined associations with monthly binge TV watching. Unadjusted variables with a *p*-value of <0.20 and theoretical basis were considered for inclusion in the adjusted model; forward selection modeling strategy was used. Variables had to meet a minimum standard of *p*<0.05 to remain in the final multivariable model. For variables with high correlations (*age* and *year in school*, *BMI* and *BMIcat*), Akaike's Information Criterion (AIC) values were examined and variables with smaller AIC values were selected for each model. A separate analysis, with the same modeling strategy, was used for respondents who defined binge TV watching as consecutively viewing between two and six hours of TV.

RESULTS AND DISCUSSION

Out of the 1,995 students who received an invitation to participate in the survey, 500 completed the survey (response rate: 25.06%). The majority of the sample was female (57.83%), white (89.36%), and unmarried (80.19%). The mean age of respondents was 20.56; the majority of respondents were freshmen in college (31.50%). The average BMI for respondents was 23.44 and most students were classified as having a “normal” BMI (55.62%); only 21% of respondents were considered overweight or obese. Over half of the sample did not meet PA recommendations (52.81%) and did not consume fruit, green vegetables, orange vegetables or other vegetables at least once per day. Almost half (44.08%) reported eating out or getting take out from a restaurant once per week (**Table 1**). When participants were asked to identify how many consecutive hours they defined as binge watching, 14% of the sample said 2 hours, 39 percent said 3 hours, 24 percent said 4 hours, and 11 percent said 5 hours. Fewer than 4% said 2 hours or less, and just over 8% believe binge watching was anything over 6 hours (data not shown). These results reflect the commonly used definition of binge watching in the literature as two to six episodes (Walton-Pattison et al., 2016), or between 45 minutes and 6 hours depending on episode length.

WEEKLY BINGE TV WATCHERS

Over 20% of respondents identified as weekly binge TV watchers (**Table 1**). In a multivariate logistic regression, weekly binge TV watching was associated with gender and frequency of eating out (**Table 2**). Females had greater odds of being weekly binge TV watchers compared to males. While the relationship of gender to binge TV watching has not previously been explored, the finding is consistent with other literature stating that females are more likely to be sedentary and engage in physical activity less often than

Table 1. Descriptive Characteristics for Emerging Adults Who Do and Do Not Self-Identify as Weekly Binge TV Watchers.

Variable	Does Not Binge; Frequency (%) ; Mean (SD); N=350 (76.59)	Binge; Frequency (%); Mean (SD); N=107 (23.41)	Total N=457
Gender			
Male	145 (44.75)	33 (34.74)	179 (42.62)
Female	179 (55.25)	62 (65.26)	241 (57.83)
Race			
White	284 (89.87)	77 (87.50)	361 (89.36)
Other	32 (10.13)	11 (12.50)	43 (10.64)
Age			
	20.60 (2.07)	20.43 (1.86)	20.56 (2.02)
Year in School			
Freshman	103 (31.79)	29 (30.53)	132 (31.50)
Sophomore	63 (19.44)	20 (21.05)	83 (19.81)
Junior	78 (24.07)	23 (24.21)	101 (24.11)
Senior	80 (24.69)	23 (24.21)	103 (24.58)
Marital Status			
Single	260 (79.75)	76 (81.72)	336 (80.19)
Married	66 (20.25)	17 (18.28)	83 (19.81)
BMI			
	23.41 (4.13)	23.53 (3.59)	23.44 (4.01)
BMI Category			
Underweight	56 (16.00)	16 (14.95)	113 (22.69)
Normal	210 (60.00)	67 (62.62)	277 (55.62)
Overweight	61 (17.43)	19 (17.76)	80 (16.06)
Obese	23 (6.57)	5 (4.67)	28 (5.662)
100% Fruit Juice Consumption			
Less than once per day	326 (93.14)	104 (97.20)	471 (94.58)
Once per day or greater	24 (6.86)	3 (2.80)	27 (5.42)
Fruit Consumption			
Less than once per day	268 (76.57)	91 (85.05)	400 (80.32)
Once per day or greater	82 (23.43)	16 (14.95)	98 (19.68)
Green Vegetable Consumption			
Less than once per day	292 (83.43)	96 (89.72)	429 (86.14)
Once per day or greater	58 (16.57)	11 (10.28)	69 (13.86)
Orange Vegetable Consumption			
Less than once per day	307 (87.71)	99 (92.52)	447 (89.76)
Once per day or greater	43 (12.29)	8 (7.48)	51 (10.24)
Other Vegetable Consumption			
Less than once per day	274 (78.29)	91 (85.05)	406 (81.53)
Once per day or greater	76 (21.71)	16 (14.95)	92 (18.47)
Frequency of Eating Out**			
Never	89 (27.22)	12 (12.63)	101 (23.93)
Once a week	146 (66.65)	40 (42.11)	186 (44.08)
2-3 times per week	74 (22.63)	36 (37.89)	110 (26.07)
4 or more times per week	18 (5.50)	7 (7.37)	25 (5.92)
Meets PA Recommendations			
No	164 (46.86)	58 (54.21)	263 (52.81)
Yes	186 (53.14)	49 (45.79)	235 (47.19)

PA= Physical Activity, BMI= Body Mass Index
 *indicates p<.05, **indicates p<0.01, ***indicates p<0.001

males (Chastin et al., 2015; Dumith et al., 2010; Frenn et al., 2005; Godfrey et al., 2014; Van Cauwenberg et al., 2014; Van Der Horst et al., 2007; Wenthe et al., 2009). There were no significant two-way interactions.

Respondents who reported eating out one time or more per week also had greater odds of being weekly binge TV

watchers compared to those who reported never eating out on an average week. Research has connected increased fast food consumption to TV viewing in adults (French et al., 2000; Hu et al., 2001; Hu et al., 2003; Panagiotakos et al., 2008) and food consumed that is prepared away from home contains more calories, is higher in fat and lower in calcium, iron, and fiber, than food prepared at home (Lin

Table 2. Adjusted Effects Associated with Weekly Binge TV Watching.

Variable	Odds Ratio*	Confidence Interval	p-value
Gender			
Male	Ref.		
Female	1.34	1.01-2.67	0.046
Frequency of Eating Out			
Never	Ref.	1.04-4.23	
Once a week	2.10	1.85-7.94	0.003
2-3 times per week	3.84	1.14-9.816	
4 or more times per week	3.34		

*Adjusted for other variables (gender, frequency of eating out) in the model

and Guthrie, 2012; Todd et al., 2010). While this study did not specifically examine fast food consumption, the association between young adults' binge watching and frequency of eating out may be cause for concern.

In a separate analysis examining those who defined bingeing as watching between two to six hours of TV, eating out was the only variable related to weekly binge TV watching. Respondents who ate out one or more time per week had higher odds of being weekly binge TV watchers compared to those who did not eat out at all (once a week versus none adjusted Odds Ratio [aOR]: 1.2.35, Confidence Interval [CI]: 1.11-4.95; two or three times per week versus none aOR: 3.97, CI: 1.84-8.61; four or more times per week versus none aOR: 4.15, CI: 1.35-12.71) (data not shown).

MONTHLY BINGE TV WATCHERS

Over 70% of respondents identified as monthly binge TV watchers (Table 3), which is consistent with the report that emerging adults are regular media users (Coyne et al., 2015). In a multivariate logistic regression, monthly binge watching was correlated with gender, year in school, and fruit consumption (Table 4). Again, females had higher odds of being monthly binge TV watchers compared to males. Upper classmen had higher odds of being monthly binge TV compared to freshmen. In Pittman and Sheehan's (2015) binge TV watching study with adults they reported that people under age 40 were more likely to binge watch. The findings in this study suggest that there are differences in odds of binge watching among young adults.

Young adults who reported consuming fruit once per day or more had lower odds of being monthly binge TV watchers compared to those who reported consuming fruit less than once per day. Several studies established an inverse relationship between TV viewing and fruit consumption in adults (Hu et al., 2001; Hu et al., 2003; Panagiotakos et al., 2008); our study found similar results with monthly binge watching. There were no two-way interactions significantly related to monthly binge TV watching.

When examining only those who defined bingeing as watching between two to six hours of TV, a separate analysis yielded similar results. Females had higher odds of being monthly binge watchers compared to males (aOR: 1.65, CI: 1.01-2.67); upper classman had higher odds of being monthly binge TV watchers compared to freshman (sophomore versus freshman aOR: 2.06, CI: 1.09-3.91; junior versus freshman OR: 2.73, CI: 1.46-5.10; senior versus freshman aOR: 7.74, CI: 3.51-17.10), and those who reported consuming fruit once per day or more had lower odds of being monthly binge TV watchers compared to those who reported consuming fruit less than once per day (data not shown).

CONCLUSIONS AND LIMITATIONS

This study should be evaluated in light of its limitations and strengths. These data are subjected to the types of biases inherent with cross-sectional and self-reported data. Yet, many underreport perceived negative behaviors, including binge TV watching, so if this bias is present the magnitude of the relationships observed may be even larger in reality. The strengths of the study include a randomized sample design with a high percentage of male participants, where other self-selecting participation studies have seen lower rates of participation among males (Galea and Tracy, 2007).

The results of this exploratory study are an important first step in highlighting young adults' reports of a newer media phenomenon and identifying important correlates between binge TV watching and young adult health behaviors. While the results from this study are not causal in nature, it is important to note that other research has identified that individuals have difficulty curbing their binge watching habits (de Feijter et al., 2016). Young adults are a particularly high-risk group of interest in this phenomenon because of their unmonitored time spent consuming media and because habits formed during young adulthood track into adulthood (Kvaavik et al., 2005; Steptoe et al., 2002). Additionally, these results identify the importance of reducing sedentary time activities among young adults,

Table 3. Descriptive Characteristics for Emerging Adults Who Do and Do Not Self-Identify as Monthly Binge TV Watchers.

Variable	Do not Binge; Frequency (%); Mean (SD); N=128 (28.01)	Binge; Frequency (%); Mean (SD); N=329 (71.99)	Total N= 457
Gender			
Male	57 (48.72)	121 (40.07)	179 (42.62)
Female	60 (51.28)	181 (59.93)	241 (57.83)
Race			
White	102 (89.47)	259 (98.31)	361 (89.36)
Other	12 (10.53)	31 (10.69)	43 (10.64)
Age**	20.09 (2.00)	20.76 (2.00)	20.56 (2.02)
Year in School***			
Freshman	57 (48.31)	75 (24.92)	132 (31.50)
Sophomore	25 (21.19)	58 (19.27)	83 (19.81)
Junior	24 (20.34)	77 (25.58)	101 (24.11)
Senior	12 (10.17)	91 (30.23)	103 (24.58)
Marital Status*			
Single	103 (87.29)	233 (77.41)	336 (80.19)
Married	15 (12.71)	68 (22.59)	83 (19.81)
BMI	22.93 (4.35)	23.64 (3.85)	23.44 (4.01)
BMI Category			
Underweight	23 (17.97)	49 (14.89)	113 (22.69)
Normal	79 (61.72)	198 (60.18)	277 (55.62)
Overweight	17 (13.28)	63 (19.15)	80 (16.06)
Obese	9 (7.03)	19 (5.78)	28 (5.662)
100% Fruit Juice Consumption			
Less than once per day	117 (91.41)	313 (95.14)	471 (94.58)
Once per day or greater	11 (8.59)	163 (4.86)	27 (5.42)
Fruit Consumption*			
Less than once per day	92 (71.88)	267 (81.16)	400 (80.32)
Once per day or greater	36 (28.13)	62 (18.84)	98 (19.68)
Bean Consumption			
Less than once per day	119 (92.97)	311 (94.53)	471 (94.58)
Once per day or greater	9 (7.03)	18 (5.47)	27 (5.42)
Green Vegetable Consumption			
Less than once per day	109 (85.16)	279 (84.80)	429 (86.14)
Once per day or greater	19 (14.84)	50 (15.20)	69 (13.86)
Orange Vegetable Consumption			
Less than once per day	112 (87.50)	294 (89.36)	447 (89.76)
Once per day or greater	16 (12.50)	35 (10.64)	51 (10.24)
Other Vegetable Consumption			
Less than once per day	95 (74.22)	270 (82.07)	406 (81.53)
Once per day or greater	33 (25.78)	59 (17.93)	92 (18.47)
Frequency of Eating Out			
Never	38 (31.93)	63 (20.79)	101 (23.93)
Once a week	50 (42.02)	136 (44.88)	186 (44.08)
2-3 times per week	23 (19.33)	87 (28.71)	110 (26.07)
4 or more times per week	8 (6.72)	17 (5.61)	25 (5.92)
Meets PA Recommendations			
No	60 (46.88)	162 (49.24)	263 (52.81)
Yes	68 (53.13)	167 (50.76)	235 (47.19)

PA= Physical Activity, BMI=Body Mass Index
 *indicates p<0.05, **indicates p<0.01, ***indicates p<0.001

Table 4. Adjusted Effects Associated with Monthly Binge TV Watching.

Variable	Odds Ratio*	Confidence Interval	p-value
Gender			
Male	Ref.		
Female	1.68	1.06-2.67	0.027
Year in School			
Freshman	Ref.		
Sophomore	2.17	1.18-3.99	<0.001
Junior	3.14	1.71-5.48	
Senior	7.54	3.64-15.61	
Fruit Consumption			
Less than once per day	Ref.		
Once per day or greater	0.43	0.25-0.72	0.001

*Adjusted for other variables (gender, year in school, fruit consumption) in the model

including binge TV watching, in order to prevent chronic disease in the future.

REFERENCES

- Ajzen I (1985) *From intentions to actions: A theory of planned behavior*. Heidelberg: Springer.
- Barr-Anderson DJ, Larson NI, Nelson MC, Neumark-Sztainer D and Story M (2009) Does television viewing predict dietary intake five years later in high school students and young adults? *International Journal of Behavioral Nutrition and Physical Activity* 6(1): 7.
- Bellisle F, Dalix AM and Slama G (2004) Non food-related environmental stimuli induce increased meal intake in healthy women: comparison of television viewing versus listening to a recorded story in laboratory settings. *Appetite* 43(2): 175-180.
- Blass EM, Anderson DR, Kirkorian HL, Pempek TA, Pricel and Koleini MF (2006) On the road to obesity: Television viewing increases intake of high-density foods. *Physiology & Behavior* 88(4-5):597-604.
- Boone JE, Gordon-Larsen P, Adair LS and Popkin BM (2007) Screen time and physical activity during adolescence: Longitudinal effects on obesity in young adulthood. *International Journal of Behavioral Nutrition and Physical Activity* 4: 26.
- Boulos R, Vikre EK, Oppenheimer S, Chang H and Kanarek, RB (2012) ObesiTV: How television is influencing the obesity epidemic. *Physiology & Behavior* 107(1): 146-153.
- Boynton-Jarrett R, Thomas TN, Peterson KE, Wiecha J, Sobol AM and Gortmaker, SL (2003) Impact of television viewing patterns on fruit and vegetable consumption among adolescents. *Pediatrics*, 112(6): 1321-1326.
- Centers for Disease Control and Prevention (2002) Behavior Risk Factor Surveillance System Core Section 4: Fruits and Vegetables. Available at: <http://www.cdc.gov/brfss/questionnaires/pdf-ques/2002brfss.pdf> (accessed 4 April 2017).
- Centers for Disease Control and Prevention (2015) About adult BMI. Available at: <https://www.cdc.gov/healthyweight/assessing/index.html> (accessed 17 April 2017).
- Chang HW, Piliavin JA and Callero PL (1988) Role identity and reasoned action in the prediction of repeated behavior. *Social Psychology Quarterly* 51(4): 303-317.
- Chastin SFM, BuckC, Freiburger E, Murphy M, Brug, J, Cardon, G, O'Donoghue G, Pigeot I, and Oppert JM (2015) Systematic literature review of determinants of sedentary behaviour in older adults: a DEDIPAC study. *International Journal of Behavioral Nutrition and Physical Activity* 12(1): 127.
- Cleland VJ, Schmidt MD, Dwyer T and Venn AJ (2008) Television viewing and abdominal obesity in young adults: Is the association mediated by food and beverage consumption during viewing time or reduced leisure-time physical activity? *American Journal of Clinical Nutrition* 87(5): 1148-1155.
- Coon KA, Goldberg J, Rogers BL and Tucker, KL (2001) Relationships between use of television during meals and children's food consumption patterns. *Pediatrics* 107(1): e7.
- Coyne SM, Padilla-Walker LM and Howard E (2013) Emerging in a digital world a decade review of media use, effects, and gratifications in emerging adulthood. *Emerging Adulthood* 1(2): 125-137.
- Crespo CJ, Smit E, Troiano RP, Bartlett SJ, Macera CA and Andersen RE (2001) Television watching, energy intake, and obesity in US children: Results from the third National Health and Nutrition Examination Survey, 1988-1994. *Archives of Pediatrics and Adolescent Medicine* 155(3): 360-365.
- de Feijter D, Khan VJ and van Gisbergen M (2016) Confessions of a 'guilty' couch potato understanding and using context to optimize binge-watching behavior. *Proceedings of the ACM International Conference on Interactive Experiences for TV and Online Video* 59-67.
- Dumith SC, Ramires VV, Souza MA, Moraes DS, Petry FG, Oliveira, ES, Ramires SV, Hallal P C (2010) Overweight/obesity and physical fitness among children and adolescents. *Journal of Physical Activity and Health* 7(5): 641-648.
- DuRant RH, Baranowski T, Johnson M and Thompson WO (1994) The relationship among television watching, physical activity, and body composition of young children. *Pediatrics* 94(4 Pt 1): 449-455.
- French SA, Harnack L and Jeffery RW (2000) Fast food restaurant use among women in the Pound of Prevention study: Dietary, behavioral and demographic correlates. *International Journal of Obesity and Related Metabolic Disorders* 24(10):1353-1359.
- Frenn M, Malin S, Villarruel AM, Slaikeu K, McCarthy S, Freeman J and Nee E. (2005) Determinants of physical activity and low-fat diet among low income African American and Hispanic middle school students. *Public Health Nursing* 22(2): 89-97.
- Galea S and Tracy M (2007) Participation rates in epidemiologic studies. *Annals of Epidemiology* 17(9): 643-653.
- Godfrey A, Lord S, Galna B, Mathers JC, Burn DJ and Rochester L (2014) The association between retirement and age on physical activity in older adults. *Age Ageing* 43(3): 386-393.
- Granberg D and Holmberg S (1990) The intention-behavior relationship among U.S. and Swedish voters. *Social Psychology Quarterly* 53(1): 44-54.
- Hagger MS, Anderson M, Kyriakaki M and Darkings S (2007) Aspects of identity and their influence on intentional behavior: Comparing effects for three health behaviors. *Personality and Individual Differences* 42(2): 355-367.
- Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Macera CA, Heath GW, Thompson PD and Bauman A (2007) Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine & Science*

- in *Sports & Exercise* 39(8): 1423-1434.
26. Hu FB, Leitzmann MF, Stampfer MJ, Colditz GA, Willett WC and Rimm EB (2001) Physical activity and television watching in relation to risk for type 2 diabetes mellitus in men. *Archives of Internal Medicine* 161(12): 1542-1548.
 27. Hu FB, Li TY, Colditz GA, Willett WC and Manson JE (2003) Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. *Journal of the American Medical Association* 289(14): 1785-1791.
 28. Jackson DM, Djafarian K, Stewart J and Speakman JR (2009) Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *American Journal of Clinical Nutrition* 89(4): 1031-1036.
 29. Jenner M (2016) It this on TIVIV? On Netflix, TVIII and binge-watching. *New Media and Society* 18(2): 257-73.
 30. Keadle SK, Moore SC, Sampson JN, Xiao Q, Albanes D and Matthews CE (2015) Causes of death associated with prolonged TV viewing: NIH-AARP diet and health study. *American Journal of Preventative Medicine* 49(6): 811-821.
 31. Kruger JS and Karmakar M. Mental health and binge television watching among U.S. adults. Unpublished data
 32. Kvaavik E, Andersen LF and Klepp KI (2005) The stability of soft drinks intake from adolescence to adult age and the association between long-term consumption of soft drinks and lifestyle factors and body weight. *Public Health Nutrition* 8(2): 149-157.
 33. Liang T, Kuhle S and Veugelaers PJ (2009) Nutrition and body weights of Canadian children watching television and eating while watching television. *Public Health Nutrition* 12(12): 2457-2463.
 34. Lin BH and Guthrie J (2012) Nutritional quality of food prepared at home and away from home, 1977-2008. Department of Agriculture, Economic Research Service report.
 35. Lorig L, Stewart A, Ritter P, Gonzalez V, Laurent D and Lynch J (1996) *Outcome measures for health education and other health care interventions*. Thousand Oaks, CA: Sage Publications.
 36. Nelson MC, Story M, Larson NI, Neumark-Sztainer D and Lytle LA (2008) Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity* 16(10): 2205-2211.
 37. Panagiotakos DB, Pitsavos C, Lentzas Y, Skoumas Y, Papadimitriou L, Zeimbekis A and Stefanadis C (2008) Determinants of physical inactivity among men and women from Greece: A 5-year follow-up of the ATTICA study. *Annals of Epidemiology* 18(5): 387-394.
 38. Pew Research Center (2015) Pew Research Center surveys, 2000-2015. Available at: <http://www.pewinternet.org/2015/06/26/americans-internet-access-2000-2015/> (accessed 10 April 2017).
 39. Pittman M and Sheehan K (2015) Sprinting a media marathon: Uses and gratifications of binge-watching television through Netflix. *First Monday* 20(10).
 40. Spangler T (2013) Netflix survey: Binge-watching is not weird or unusual. Available at: <http://variety.com/2013/digital/news/netflix-surveybinge-watching-is-not-weird-or-unusual-1200952292> (accessed 11 April 2017).
 41. Sparks P and Shepherd R (1992) Self-identity and the Theory of Planned Behavior: Assessing the role of identification with "Green Consumerism". *Social Psychology Quarterly* 55(4): 388-399.
 42. Steptoe A, Wardle J, Cui W, Bellisle F, Zotti AM, Baranyai R and Sanderman R (2002) Trends in smoking, diet, physical exercise, and attitudes toward health in European university students from 13 countries, 1990-2000. *Preventative Medicine* 35(2): 97-104.
 43. Stroebele N and de Castro JM (2004) Television viewing is associated with an increase in meal frequency in humans. *Appetite* 42(1): 111-113.
 44. Terry DJ, Hogg MA and White KM (1999) The theory of planned behaviour: Self-identity, social identity and group norms. *British Journal of Social Psychology* 38(Pt 3): 225-244.
 45. The Nielsen Company (2016) The Nielsen total audience report: 1st quarter 2016. Available at: <http://www.nielsen.com/content/dam/corporate/us/en/reports-downloads/2016-reports/total-audience-report-q1-2016.pdf> (accessed 31 March 2017).
 46. Theodorakis Y (1994) Planned behavior, attitude strength, role identity, and the prediction of exercise behavior. *The Sport Psychologist* 8(2): 149-165.
 47. Todd JE, Mancino L and Lin BH (2010) The impact of food away from home on adult diet quality. Department of Agriculture, Economic Research Service report.
 48. US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion and Division of Nutrition and Physical Activity (1999) *Promoting physical activity: A guide for community action*. Champaign, IL: Human Kinetics.
 49. Van Cauwenberg J, De Donder L, Clarys P, De Bourdeaudhuij I, Owen N, Dury, S, De Witte N, Buffel T, Verste D and Deforche, B (2014) Relationships of individual, social, and physical environmental factors with older adults' television viewing time. *Journal of Aging and Physical Activity* 22(4): 508-517.
 50. Van Der Horst K, Paw MJ, Twisk JW and Van Mechelen W (2007) A brief review on correlates of physical activity and sedentariness in youth. *Medicine & Science in Sports & Exercise* 39(8): 1241-1250.
 51. Walton-Pattison E, Dombrowski SU and Proulx J (2016) 'Just one more episode': Frequency and theoretical correlates of television binge watching. *Journal of Health Psychology*: 1-8
 52. Wansink B (2010) From mindless eating to mindlessly eating better. *Physiology & Behavior* 100(5): 454-463.
 53. Wenthe PJ, Janz KF and Levy SM (2009) Gender similarities and differences in factors associated with adolescent moderate-vigorous physical activity. *Pediatric Exercise Science* 21(3): 291-304.
 54. Wijndaele K, Brage S, Besson H, Khaw KT, Sharp SJ, Luben R, Wareham NJ and Ekelund U (2011) Television viewing time independently predicts all-cause and cardiovascular mortality: The EPIC Norfolk study. *International Journal of Epidemiology* 40(1): 150-159.