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THE EFFECT OF WORK AND PARENTAL ROLE OCCUPANCY AND ROLE PERFORMANCE ON EXERCISE PARTICIPATION AMONG U.S. ADULTS

A Thesis in

Sociology and Demography

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ABSTRACT

To maintain a healthy weight and minimize the risk of negative health outcomes, federal guidelines advocate for regular participation in moderate-intensity exercise. Despite the efforts of such public health campaigns, many Americans may find it difficult to engage in the recommended amount of exercise while also devoting time to the demands of work and parenting. Previous research examining the relationship between work, parenting, and taking part in exercise has not adequately teased apart the differences between occupying a role and performing said role. Using data from the American Time Use Survey's (ATUS) Eating and Health Module (EHM), I draw on social role theory and the time availability perspective to examine whether there are distinct effects of worker/parental *occupancy* versus work/parenting role *performance*. Results from zero-inflated negative binomial regression models indicate that the relationship among work, parenting, and exercise varies depending on whether the worker/parent role is operationalized in terms of occupancy or performance. I conclude that research focusing on the link between social roles and health behaviors must take care not to conflate role occupancy indicators with role performance indicators.

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INTRODUCTION

Exercise is touted as an important determinant of physical and mental well-being, and is promoted as a central strategy for curbing obesity in the United States (CDC 2014).[1] The Department of Health and Human Services' *2008 Physical Activity Guidelines for Americans* recommends at least 2 hours and 30 minutes of moderate-intensity exercise a week, spaced out in episodes of at least 10 minutes at a time to maintain a healthy weight and minimize the risk of negative health outcomes (DHHS 2008). Despite the efforts of such public health campaigns, many Americans may find it difficult to take part in the recommended amount of exercise while also devoting time to the demands of work and parenting. To better understand how time spent in exercise may differ between individuals across work and parenting roles, it is important to examine the effects of work and parenting on exercise.

Evidence indicates that employment and parenthood are negatively associated with exercise (Bianchi, Robinson, and Milkie 2006; Bird and Fremont 1991; Bittman and Wajcman 2002; Hultsman 1995; Nomaguchi and Bianchi 2004; Taniguchi and Shupe 2012). However, the mechanisms underlying these relationships remain unclear. On the one hand, it could be that occupying the role of worker and/or parent is associated with exercise. Alternatively, it may be that it is not *occupying* the role of worker and/or parent that influences exercise participation per se, but rather it is whether individuals are performing a given role (i.e. engaging in activities associated with a role) that matters. Conceptually, the aforementioned distinction is one between (1) *occupying a role (parent vs. non-parent, working for pay vs. not working for pay)*, and (2) *performing a role (engaging in role-related activities vs. not engaging in role-related activities)* (Biddle 1966).

[1] In keeping with the extant literature, I focus on purposeful exercise (i.e., that which is done for the express purpose of exercising) rather than physical activity/exercise that takes place during routine activities of daily living (e.g., carrying groceries, doing household repairs, yard work, etc.).

Early research on the connection between being a worker/parent and exercise treated these role occupancy variabes as a series of binary categories, and concluded that simply holding the role of worker and/or parent influences exercise (Schramm, Stockbauer, and Hoffman 1996; Verhoef, Love, and Rose 1993). By capitalizing on the availability of more detailed information on the role of worker in the 1995 supplement to the National Health Interview Survey, Nomaguchi and Bianchi (2004) were able to move beyond binary indicators of employment and captured role performance (operationalized as the number of hours individuals spent at work during a typical week). The authors found that work performance is negatively associated with time spent engaging in exercise. Their approach suggests that it is fruitful to move beyond binary indicators of role occupancy, at least in the case of work, and consider a worker's role performance (in this case, usual hours worked) when attempting to uncover the consequences of the worker role on time spent in exercise. Though Nomaguchi and Bianchi (2004) were able to measure work role performance, they were unable to explore parental role performance due to data limitations; instead, they examined indicators of parental role occupancy. Consistent with earlier studies on parental role occupancy and exercise time (Verhoef et al. 1993), Nomaguchi and Bianchi (2004) found that being a parent—namely, a parent of a child under the age of 5—predicts fewer minutes spent in exercise. Across the studies that examine occupying the role of parent, the authors argue that the association between parental role and exercise is because of parents' performance of their role. However, because these studies fail to measure parental role performance, the extent to which it matters is unknown.

The development of large-scale time diary studies has provided researchers with the opportunity to more carefully measure how people spend their time participating in various activities (Bianchi et al. 2006; Robinson and Godbey 1997). Taniguchi and Shupe (2012) used time-use diary data to investigate how the amount of time people spent in different activities influenced how much they exercised. Their results suggest that increased performance of work

and family roles—defined by greater amounts of time spent in a role-associated activity—is related to less time in which individuals are able to participate in exercise. Taniguchi and Shupe (2012) contributed to the literature by shifting focus to role *performance* rather than role occupancy. One limitation, however, is that their study clumped all unpaid work activities (e.g., parenting, household chores, food prep, household management) into one time use variable, thus obscuring the relationship between activities associated with occupying the role of parent and exercise.

In sum, past research indicates that the relationship between work/parent roles and engagement in exercise is generally negative. However, these studies either were unable to adequately assess role performance across both work *and* parenting (Nomaguchi and Bianchi 2004), or did not tease apart parenting activities from other unpaid activities (Taniguchi and Shupe 2012). Because of the limitations of these aforementioned studies, there is a gap in the literature concerning the link between work/parenting roles and exercise. Specifically, the question remains whether some inherent characteristic of occupying the role of worker and/or parent influences exercise behavior, or if it is the actual performance or work and parenting activities that matters. Furthermore, competing hypotheses (role attachment vs. role burden) regarding the nature of the relationship between role occupancy vs. role performance warrant more investigation. The aim of the present study is to use the American Time Use Survey's (ATUSs) Eating and Health Module (EHM) to more thoroughly explore the relationship between role occupancy, role performance, and exercise. For the purpose of this study, role occupancy is defined as whether or not an individual is a parent and/or worker. Role performance will be defined as whether or not an individual engages in any activities associated with the role of parent and/or worker.

BACKGROUND

It is common for individuals to occupy the role of worker and/or parent during some point in their life course (Kohli 2007; Neugarten, Moore, and Lowe 1965; Settersten and Hagestad 1996a; 1996b). Though holding the role of worker and parent has been quite common across history, the meaning and expectations surrounding these roles have changed. For instance, due to recent cultural and economic pressures, men and women are now commonly expected to be both devoted parents and productive workers (Hays 1996; Hochschild 1997). Socioeconomic pressures have shifted how working and parenting roles are performed. Specifically, engagement in work/parenting roles has become more engrossing (Bianchi et al., 2006; Fox et al., 2013). Increased focus and commitment to work and parenting, coupled with taking part in other family roles (e.g., being a spouse) means that other activities are sacrificed in order to meet more immediate demands. Despite the clear health benefits associated with exercise (Mcknight-Eily et al. 2011; Snowden et al. 2011), evidence suggests that it may be among the first activities that people drop if they engage in it in the first place (Bianchi et al. 2006). In the following section, I outline the key theoretical perspectives motivating the present study. Next, I review the literature showing the significance of worker/parental role occupancy and work/parenting role performance as they relate to health behaviors. I conclude with a discussion of partnership status, household chores, sociodemographic characteristics, and health factors which have also been empirically linked to exercise involvement.

Social Role Theory

Social role theory, or simply role theory, has its origins in American philosophy and social psychology. It has since emerged as a useful perspective for sociologists interested in understanding structural influences on human behavior (Biddle 1966; Biddle 1986). Most commonly, social role theory is explained using a dramaturgical analogy: individuals in society

are cast in a part and their actions and behaviors are governed by a social 'script' that is overseen by a director (e.g., parent, supervisor, cultural norms) (Biddle 1996). To put it in more concrete terms, consider a man who has fathered a child. He is now cast as a parent and his taking part in his newfound role is governed by what society has deemed to be acceptable parenting practices for men.

The original formulation of role theory includes a distinction between role occupancy and role performance. Occupying a role and performing a role are inherently connected, as people are permitted to perform a role only if they occupy that role. Moreover, occupying a role is only meaningful insofar the role is performed. For example, one must have guardianship over children to be a parent—occupying the role—but the social meaning of parenthood only emerges through parenting—performing the role. Because of this dynamic, when examining how occupying a particular role influences someone's life, it is necessary to consider role performance (Biddle 1966). For the present purposes of studying how worker/parental role occupancy impacts exercise, social role theory would contend that simply examining whether or not one occupies a role and how it relates to taking part in exercise is not enough. Instead, whenever possible, it is important to consider whether individuals are performing activities related to their role (Biddle 1966; Biddle 1986; Nomaguchi and Bianchi 2004; Taniguchi and Shupe 2012).

The Time Availability Perspective

Time is a finite resource, one that is fixed at 24 hours per day. As such, as an individual increases their involvement in a particular activity on a given day, they must compensate by lessening participation in other activities. This is the essence of the time availability perspective (Coverman 1985; England and Farkas 1986; Hiller 1984; Nomaguchi and Bianchi 2004). Given the focus on activity tradeoffs, the time availability perspective can be seen as an economic model, wherein time is a scarce resource and individuals must make decisions on how to spend it. When it comes to predicting activities such as exercise, the time availability perspective posits

that competing demands of work and family lead to a necessary tradeoff between role obligations and free time (Bianchi et al., 2006; Nomaguchi and Bianchi 2004). Simply put, the demands of performing high priority activities limit the amount of time people can spend on low-priority activities. Based on the idea that engagement in activities needs to be distributed across 24 hours, research in this area adopts a "time-as-currency" approach, introducing concepts such as time poverty (Vickery 1977) and the stratification of free time by social role participation (Harvey and Mukhopadhyay 2007). Though the time availability perspective emphasizes time, it is not essential to examine time spent in all activities when applying the perspective. Instead, it is sufficient simply to understand the logic behind the perspective: participation in one activity reduces time spent in other activities (Coverman 1985).

Tying Social Role Theory and the Time Availability Perspective Together: An Examination of Work, Parenthood, and Competing Hypotheses

Like the time availability perspective, social role theory asserts that individuals make a tradeoff after assessing which roles are of higher priority. Occupying roles which are deemed more important may be accompanied by more extensive role performance and greater participation, either through enjoyment or obligation. From a time availability perspective, such behavioral investments are "expensive," leaving less time for other activities. Taken together, social role theory and the time availability perspective suggest that people will make tradeoffs between spending any time in role-related activities and health promoting activities, especially when individuals occupy roles that require a great deal of engagement because of higher demand. A particular strand of role engagement research focuses on the health and health behavior consequences of being a worker, being a parent, and the activities associated with those roles (Burgard and Ailshire 2013; Lahelma et al., 2002; Waldron, Weiss, and Hughes 1998; Verbrugge 1983). Two central hypotheses emerge from social role theory regarding its impact on health and health behaviors. The role burden hypothesis predicts that the performance of roles increases the

amount of role-related strain individuals experience, which in turn has deleterious effects on health (Lahelma et al., 2002). Conversely, the role attachment hypothesis proposes that occupying a role and performing activities connected to a role is associated with increased health via integration into society (Bartley et al., 1999), by providing a boost to self-esteem and sense of meaning (Lahelma et al., 2002), and by providing socioeconomic benefits via employment (Kawachi et al., 1999). Empirical investigation of the two hypotheses suggests employment is protective of health, thus supporting the role attachment perspective (Lahelma et al., 2002, Waldron, Weiss, and Hughes 1998). For parenthood, however, simply being a parent was found to be negatively associated with certain health outcomes and health behaviors, including depression (Evenson and Simon 2005) and exercise (Nomaguchi and Bianchi 2004). However, by failing to account for the extent to which individuals actually took part in role-related activities, these studies fail to make a distinction between role occupancy and performance. In summation, role performance (here defined as time engaged in a role) is negatively associated with time for sleep (Burgard and Ailshire 2013), time for leisure (Bianchi et al., 2006), and time for cooking (Jabs and Devine 2006). So simply examining a dichotomy of role occupancy is not sufficient to fully understand the relationships between work, parenthood, and exercise. Performing activities associated with working and parenting are equally, if not more, important predictors of exercise time. Therefore, it is crucial to distinguish between role occupancy and role performance as they appear to influence health behaviors in different ways.

Partnership Status and Household Chores: Considerations of Other Common Roles and Activities

In addition to examining the effects of work and parental role occupancy, occupying the role of spouse/partner is also worthy of investigation. Domestic partners are expected to perform their roles in a gendered way, with women being more likely to do housework while men work more in the public sphere (Bianchi et al. 2006). Evidence indicates that such performances of the

spousal role are linked to reductions in exercise (Bird and Fremont 1991; Taniguchi and Shupe 2012).

It should be noted that the activities associated with partnership roles are more difficult to capture than working and parenting. Whereas work and parenting are characterized by activities that are directly related to the role (i.e., workers must complete assigned tasks in order to receive a pay check; parenting requires physical care and nurturing of children), the activities performed because one is partnered are more ambiguous. Certainly, there are clear activities that are related to the role of spouse/partner, including physical care for one's partner, sexual activity with one's partner, and spending time with one's partner. However, there are other activities that one performs because of the gendered nature of partnership. The difficulty in capturing purely spouse/partnership related activities partially explains Taniguchi and Shupe's (2012) decision to combine non-paid work activities into one category labeled *unpaid work*. Though their study was able to examine work and non-work related activities and how they influence exercise time, they were unable to single out either parenting or partnership role performance, thus masking the singular effects of occupying these two important social roles. Ideally, partnership role performance would be modeled. However data limitations often prevent the detailed examination of the partnership role (Nombaguchi and Bianchi 2004).

Lastly, time spent in household chores is important to consider, as the amount of time people spend managing and keeping their home in order places further constraints on time for exercise (Bianchi et al. 2006). Though "household chore master" is not a recognized role in the research literature, it nevertheless has consequences for exercise, as it may further decrease the amount of time workers/parents can spend in exercise.

The Importance of the Day of the Week

Any discussion of role performance must be accompanied by consideration of what determines whether an individual performs a particular role. Most obviously, whether an

individual occupies a role determines whether or not they are eligible to perform the activities associated with that role (Biddle 1966). For example, in order for a woman to be eligible to perform the roles associated with being a mother, she must have children. However, individuals who occupy the role of worker and/or parent may not perform the activities associated with those roles because of the day of the week. For instance, paid work tends to be concentrated on the weekdays, and therefore it is more likely that workers do not perform work related activities on Saturdays and Sundays (Bianchi et al. 2006). With parenting, the distinction between weekdays and weekends may also matter.

Sociodemographic Characteristics, Health Conditions, and Exercise

Exercise participation differs by age, race, and class. Past research has found aging to be negatively associated with both likelihood to take part in exercise, and total duration of exercise (Sallis 2000; Milanovic et al. 2013) due to the higher prevalence of physical limitations and chronic health conditions associated with old age (Crimmins et al. 2010). Racial/ethnic differences are more equivocal, with some studies finding that racial and ethnic minorities exercise less than whites (e.g., Sirard et al. 2008) and other research finding either the opposite or no racial/ethnic differences (Owen et al. 2009). Socioeconomic differences also have been documented, with individuals with lower levels of education and lower incomes having lower rates of sports and exercise participation than their more affluent peers (Pampel 2010).

Health and physical characteristics are also important determinants of exercise. As previously mentioned, chronic health conditions (measured using self-report) are associated with aging and have been known to lower participation in exercise (Crimmins et al. 2010). As a measure, self-rated health is both valid and ubiquitous in social science research and has been recommended for inclusion in health surveys (Jylha 2009). Similarly, body mass index (BMI) has been linked to exercise, with overweight and obese individuals not exercising as much as their normal weight counterparts. These results from previous research warrant the consideration of

various sociodemographic and health characteristics in conjunction with parenting and work roles.

In sum, my argument rests on the notion that being a worker and/or a parent and the performance of activities associated with occupying these roles have a clear relationship with non-role related activities such as exercise. Working for pay and parenting are likely prioritized more because of both economic necessity (i.e. needed income) and cultural values surrounding the expectations of parents (Bianchi et al. 2006; Goode 1960; Hays 1996). Because exercise may be viewed as a low priority relative to work and family obligations, it may be one of the first activities to be cut given the limited availability of time.[2] Social role theory and the time availability perspective provide sound rationale for examining how engagement in roles like worker and parent impact the amount of exercise an individual takes part in. However, it is not enough to focus on working and parenting. Prior research has shown that other statuses, household activities, sociodemographic characteristics, and health status are also related to participation in exercise. Thus, these additional factors must be considered in any examination of the association between worker/parent role occupancy, role performance, and exercise participation. The present study considers previous research and contributes to the literature by explicitly modeling engagement in work and parenting roles, thus tapping into role performance and how it relates to exercise.

[2] It is important to note that parenthood and work vary greatly with regards to time pressures. For instance, being a parent to a young child and working a job with an inflexible schedule would certainly shape the relationship between family/work demands and other activities.

RESEARCH HYPOTHESES

Guided by social role theory, the time availability perspective, and previous research on work, parenthood and health behaviors I arrive at the following two research hypotheses pertaining to worker/parental *role occupancy*:

(H1) When considering worker role occupancy, working for pay is positively associated with exercise engagement.

(H2) When considering parental role occupancy, having one's own child in the household is negatively associated with exercise engagement.

However, as previously mentioned, the relationship between holding a work position and health behaviors is altered when considering performance in activities related to work positions by way of tradeoffs. For parenting, the relationship tends to be the same. Consequently, when it pertains to work and parenting role *performance* (i.e. spending any time in activities related to work or parenthood), I hypothesize that:

(H3): When considering work role performance, engaging in work related activities are negatively associated with exercise engagement.

(H4): When considering parenting role performance, engaging in at least one activity associated with parenting one's child who resides in the household is negatively associated with exercise engagement.

Addressing the above hypotheses will help to further understand the importance of distinguishing between the effects of role occupancy and the effects of role performance when it comes to exercise.

DATA AND METHODS

ATUS Sampling Scheme and Eating and Health Module Selection

Data for this study come from the American Time Use Survey's (ATUS) Eating and Health Module (EHM). Respondents of the EHM are a subset of ATUS respondents. Administered by the U.S. Census Bureau and commissioned by the Bureau of Labor Statistics, the ATUS is the first nationally representative, continuous time-diary survey run by the U.S. Federal government. The ATUS sample is drawn from the Current Population Survey (CPS) sample, which is representative of the civilian, non-institutionalized population who reside in households within the United States. Households become ATUS-eligible two months after completing their eighth and final CPS interview. For any given month, approximately 7,500 households sampled by the CPS enter the ATUS sampling universe. ATUS then uses the following three-stage sampling procedure: (1) eliminate the CPS use of oversampling in less populated states and stratify households by race/ethnicity, number/age of children, and number of adult-only households, (2) oversample racial/ethnic minority households and households with children, (3) and randomly select a respondent aged 15 or older to be surveyed.

Response rates for the ATUS range from 52.5 to 57.8 percent between 2003 and 2012 and are comparable to other nationally representative telephone surveys (Curtin et al. 2005). The EHM, which collects information on time use, food related activities, and obesity, was administered to all ATUS respondents from 2006 to 2008. Response rates for these three years are similar to rates across all other survey years (55.12% in 2006; 52.5% in 2007; 54.6% in 2008). The majority of non-response is due to inability to contact respondents as opposed to respondent refusal (60% vs. 40%), with men and individuals less integrated into the community being less

likely to respond (Abraham, Maitley, and Bianchi 2006). Response rates to the EHM were dramatically higher, with more than 99% of ATUS respondents also completing the module.

To account for potential differences across weekdays and weekends, half of the diary days assessed were weekdays, while the other half examined were weekends. Information on respondents' time use is collected using conversational interviewing techniques, asking respondents to walk through their previous day (4:00am on the previous day to 4:00am on the interview day), reporting each activity and the duration of each activity. Respondents are also asked to report the location of each activity as well as who was present during each activity. To account for individuals reporting an excess of 24 hours, the survey includes a residual category that captures all time outside the 24 hour window. These data can therefore be used to produce population estimates of average time use (Kendig and Bianchi 2008).

Study Sample and Weights

For the present study, I use the 2006-2008 pooled sample of EHM respondents. EHM measures include self-reported height and weight (used to calculate Body Mass Index [BMI]), and self-reported health, two well documented determinants of exercise participation (Grzywacz and Marks 2001). Because I am interested in the effects of work and parenting role performance on exercise, I restrict my sample to adults aged 18-64 years, the period of the life course most likely characterized by work as well as parenting children under the age of 18 (Anxo et al. 2011). Appendix A presents a table comparing characteristics of (a) the full ATUS sample for 2006-2008, (b) the respondents to the EHM, and (c) the present study's analytic sample. Though there is recent evidence indicating that a substantial proportion of men and women work beyond the age of 65 (Warner, Hayward, and Hardy 2010), the greatest proportion of workers and parents are in the 18-64 age range (confirmed by Appendix B which presents proportions of work and parenting roles by age range). My final sample includes 29,233 individuals who completed the EHM, or 77% of total EHM respondents. My dataset was constructed using the ATUS Data

Extract System Version 2.4 (Hofferth, Flood, and Sobek 2013). To account for oversampling and non-response in the survey, I utilize the EHM sampling weights for descriptive and multivariate analyses. The EHM weights also allow for correct estimation of activities more commonly done during the weekend.

Dependent Variable

Exercise time on the diary day serves as my dependent variable. To construct this measure, I examine all primary activities in the "Participation in Sports, Exercise, and Recreation" activity category and identify the activities that qualify as at least moderately intense. Activity intensity is based on each individual activity's metabolic equivalent of task value (METs) defined as the ratio of the amount of energy consumed during X activity to a reference rate set by convention. MET values range from 0.9 (sleeping) to 22 (running at 14mph), with high MET values translating to more energy output during a given activity. I use the conventional cut-point of 3 METs to denote moderate intensity activities, with activities below this value being excluded from the analysis (Tudor-Locke et al. 2009). Said selection criterion excludes only 2 of the 37 listed categories (playing billiards (2.5 METs) and unspecified work out (2.5 METs). In sum, the activities used to construct the dependent variable include 35 activities of at least moderate intensity (≥3 METs) (see Appendix C for listing of activities and their corresponding MET values). Following the grouping of the activities that qualify as sports and/or exercise into one category, I then rescale the dependent variable into 10 minute increments.[3]

[3] Rescaling the dependent variable in this manner was based on both conceptual and empirical considerations. Not only does the Department of Health and Human Services recommend aerobic exercise in bouts of at least 10 minutes each, but creating 10 minute increments was the minimal rescaling needed to estimate the zero-inflated negative binomial model used for multivariate analyses. To ensure that my findings are not an artifact of variable scaling, I conduct several sensitivity analyses where I compare parameter estimates and *p*-values of focal predictor variables for 15, 20, 25, and 30 minute scalings. Results across models were largely consistent. See Appendix D for comparison of results across differential dependent variable scaling.

Focal Predictor Variables

Central to the present analysis are the roles of worker and parent which I conceptualize in two different ways: role occupancy and role performance. I construct my role occupancy measures using CPS household roster data which is linked to the ATUS and EHM. *Work for pay* denotes whether or not individuals are employed in some type of paid work, while *parent of child under the age of 18 in the household* indicates those individuals who hold the parenting role. I expand the parental role occupancy variable by also including *number of children under age of 18* which denotes the number of children in the household, and *parent of young child* which serves as an indicator as to whether the individual has a child under the age of 5 in the household. To move beyond role occupancy and tap into role performance, two additional focal predictors are constructed using both CPS household roster data and ATUS time use data (time engaged in work and parenting related activities as a primary activity). Specifically, two variables (one for work and another for parenthood) are measured as mutually exclusive categories formed by the intersection of role occupancy and role performance. *Parental role occupancy and performance* is a categorical variable distinguishing those who are a) childless, b) parents who perform no parenting on the diary day, and c) parents who perform parenting on the diary day. *Worker role occupancy and performance* is a categorical variable that distinguishes those who: a) are not working for pay (includes individuals unemployed due to a layoff (0.66%, individuals who are searching for work (4.05%), and individuals no longer in the labor force (17.98%)); b) are working for pay but do not work during the diary day; c) are working for pay and work for <8 hours during the diary day; and d) are working for pay and work ≥8 hours during the diary day. I use these cut-points to reflect part time and full time work.

Given extensive research linking additional variables to the ones mentioned above to exercise, I include a number of covariates which serve as statistical controls. *Partnership status* distinguishes those who are a) single, b) cohabiting, and c) married. I construct partnership status

measures utilizing the CPS household roster linked to the ATUS. *Time spent in household chores*, a continuous measure denoting the number of minutes individuals devote to household chores, is also included to account for activities related to keeping the home.

A number of sociodemographic and physical health indicators are included as statistical control variables based on their noted association with taking part in sports and exercise. *Age* is included and is treated as a continuous variable ranging from 18 to 64 years of age (I mean center age for multivariate analyses). *Female* is an indicator variable denoting the respondent's gender. *Race/Ethnicity* includes non-Hispanic whites (reference category), non-Hispanic blacks, non-Hispanic other race, and Hispanics, any race. *Education* is measured using 5 categories including less than high school, high school grad/GED recipient (reference category), some college, and Bachelor's degree or higher. *Family income* is a categorical variable that includes individuals making: a) less than $12,500, b) $12,500-$24,999, c) $25,000-$34,999, d) $35,000-$49,999 (reference category), e) $50,000-$74,999, f) $75,000-$99,999, and g) $100,000+.

As previously mentioned, the motivation for using the EHM stems from its inclusion of physiological/health variables that are important for exercise. In this analysis, I use *Body Mass Index (BMI)* and *self-rated health* as proxies for overall physical functioning related to the likelihood of engaging in exercise. BMI is calculated using respondent's self-reported height and weight and the standard CDC formula $BMI = \frac{weight\ (lb) \text{x}\ 703}{(height\ in\ inches)^2}$. I then treat BMI as a categorical variable using CDC cutoffs to indicate if a respondent is not overweight (BMI<25), overweight (BMI 25.0-29.9), or obese (BMI$\geqslant$30). Self-rated health is represented as a standard 5 category ordinal variable ranging from 1 (Poor Health) to 5 (Excellent Health). Though the validity of both BMI and self-rated health have been challenged in previous research, a number of recent studies suggest that both measures are adequate for examining health behaviors despite their superficial nature (McAdams et al. 2007; Schnittker and Bacak 2014). An additional potential issue with

using BMI in a study on exercise is that there may be endogeneity problems.[4]

Finally, because the the relationship between the central predictor variables and exercise time may operate differently across weekdays vs. weekends, I test for potential moderating effects of weekend days. None of the interactions between weekend and roles were found to be statistically significant, leading me to conclude that the relationships between the focal predictor variables and exercise hold across all days of the week (See Appendix F for tables testing interaction effects). Therefore, I include *weekend* (an indicator that the diary day assessed was on Saturday or Sunday) as a control to account for possible increased involvement in exercise on the weekends. I do the same for *holiday* (an indicator that the diary day assessed was during a holiday).

Analytic Strategy

I begin my analysis by examining descriptive statistics of the analytic sample by diary day (weekday vs. weekend). Results are presented in Table 1. I then stratify respondents by employment role occupancy and role performance groupings to better understand the characteristics of workers who engage in paid work versus those who do not (Table 2). Table 3 provides summary statistics for respondents stratified by parental role occupancy and role performance groupings. This table provides more information on the characteristics of those parents who engage in parenting on the diary day versus those who do not. All descriptive statistics were calculated using unimputed data and EHM weights.

To detail the distribution of the exercise variable, the activities related to working, and the activities related to parenting, I provide four histograms (Figures 1-4). Figure 1 presents a histogram of the distribution of number of 10 minute exercise bouts among the entire sample. Figure 2 also presents a histogram of the distribution of 10 minute exercise bouts, but only for

[4] See Appendix E for parameter estimates in a model with BMI excluded. Results are consistent across model, so BMI was retained in final model estimation.

those who engage in some exercise. The distribution of minutes engaged in paid work is displayed in Figure 3, while Figure 4 displays the distribution of minutes engaged in parenting.

In order to test my hypotheses, I estimate a series of multivariate zero-inflated negative binomial (ZINB) regression models. My use of ZINB regression models as opposed to ordinary least squares (OLS) regression is based on the non-normal distribution and the large proportion of zeros (78% of the sample) present in the dependent variable.

The ZINB regression model assumes that an individual's value of zero on a given outcome is generated through one of two processes (Long 1997). First, there will be individuals who will always have a value of zero on the dependent variable. In the context of exercise, these are individuals who just never engage in exercise. Second, there are individuals who have a value of zero on the dependent variable by chance. Again, with regards to exercise, these are individuals who may typically exercise, but have a zero value on a given day entirely due to chance. To distinguish between those who will always have a zero value on the dependent variable and those who are eligible for other values but obtain a zero on the dependent variable by chance, the ZINB model estimates coefficients using the zero-inflated quation (Cheung 2002; Long 1997). These ZI coefficients predict the likelihood that an individual's zero value is generated by them being ineligible for any other value but zero (e.g. those who just never exercise). A positive ZI coefficient is indicative of an increased likelihood of always having a zero value. For a more concrete example, let's consider hypothetical ZI coefficients associated with the variable GENDER. If we find that GENDER (with men serving as a reference group) has a statistically significant ZI coefficient of .256, we know that, relative to men, women have a higher likelihood of belonging to the group of zeros represented by those who never exercise. Through exponentiation, we would interpret the result as meaning that women have 29% higher odds of being in the never exercise group ({[1-exp(.256)]*100}).

Not only does the ZINB regression model predict those who always have a zero value

versus those who have a zero value by chance, but it also predicts the expected count on the dependent variable via the NB equation (Cheung 2002; Long 1997). To predict the count on the dependent variable, the ZINB model produces NB coefficients. A positive NB coefficient is indicative of a higher count on the dependent variable whereas a negative coefficient is interpreted as a reduction in the count on the dependent variable. If we return to the example of GENDER and how it relates to exercise time, if GENDER has a statistically significant NB coefficient of -.38, the negative sign of the coefficient would indicate that women have a lower expected count of exercise minutes relative to their male counterparts. Through exponentiation, we find that, compared to men, women have a lower count of exercise bouts by a factor of 0.68 (exp[-.38]) or 32% ({[1-exp(-.38)]*100}).[5] For a more extensive discussion of the rationale, assumptions, and extensions related to the ZINB regression model, see Long (1997).

Though I choose to estimate ZINB models, other models such as two-part and hurdle models have been deemed appropriate for use for excess zeros (Long 1997; Neelon and O'Malley Working Paper). Though the utility of these models is without question, my decision to utilize the ZINB model as opposed to other methods is conceptually based. Namely the distinction between those who exercise on a given day versus those who do not is not as simple as a hurdle model may suggest. There are some in the population who do not exercise either for health or other lifestyle reasons. Of those who do exercise, exercise is highly irregular on any given day. Some individuals generally do exercise, but on any given day they may spend 0 minutes in exercise for a plethora of reasons but are still at 'risk' of engaging in exercise. Because zero values reflect both those at risk and those not at risk for exercise, the ZINB is the ideal model. Previous research on cigarette consumption (Sheu et al. 2004) and prescription drug use (Grootendorst 1995) has utilized similar logic for applying zero-inflated models instead of alternatives

[5] The ZINB also generates the Ln(α) and α coefficients. This set of parameters assesses dispersion. A statistically significant Ln(α) coefficient provides support for using the ZINB model over the similar zero-inflated Poisson (ZIP) regression model.

(Grootendorst 1995; Sheu et al. 2004).

Model 1 of the ZINB regression model tests Hypotheses 1 and 2 by regressing exercise time on worker and parental role occupancy as well as a number of statistical controls. Like Model 1, Model 2 also tests Hypotheses 1 and 2, but includes a more detailed look at parental role occupancy (inclusion of indicators of whether the respondent is the parent of a child under the age of 5 as well as the number of children in the household). Lastly, Model 3 tests Hypotheses 3 and 4 by considering worker and parent role performance along with role occupancy and statistical controls. For multivariate analyses, all models were estimated on the pooled imputed datasets with EHM weights applied.

Because complete case analysis can yield biased results and large standard errors, missing values on 3 predictor variables warranted the use of multiple imputation, namely family income, BMI, and self-rated health. Missing values are particularly high on family income (10% missing) and moderately high on BMI [6% missing] (Allison 2001). [6] I generated 5 imputed datasets via multiple imputation using chained equations (MICE), an improvement over multivariate normal imputation, in that it does not assume that all variables in the imputation model have a multivariate normal distribution (Lee and Carlin, 2010; Royston and White, 2011; White, Royston, and Wood, 2011). The imputed datasets were then pooled to arrive at more precise parameter estimates and standard errors in multivariate analyses. All statistical analyses were conducted using Stata 13.

[6] Other missing values were imputed by Bureau of Labor Statistics staff using relational imputation, longitudinal assignments, and hot-deck allocation procedures.

RESULTS

Sample Summary Statistics

Table 1 provides weighted means and proportions of respondent characteristics both for the overall sample, and by weekday/weekend dairy day assessment. To test for significant differences between role occupancy, role performance, and control variables by weekday and weekend diary day assessment, I conducted a series of either weighted logistic or weighted OLS regression models for binary and continuous variables respectively, with weekend serving as the sole independent variable.

Overall, 22% of individuals report spending any time in exercise during their diary day. Of those who do engage in exercise, the number of 10 minute bouts is high, with a mean of 11.5 (approximately two hours). Whether the day assessed is a weekday vs. a weekend makes a difference for both exercise participation and the amount of time spent in exercise. Indeed, exercise is more common on the weekends. The proportion of individuals who engage in exercise is significantly higher on the weekends relative to weekdays (24% vs. 21%; $p \leq .001$). Moreover, the count of 10 minute exercise bouts is found to be greater on the weekends (14.5) than on the weekdays (10.14).

With regards to individuals occupying the role of worker and/or parent, there are no differences in the distribution of parents and workers across weekdays and weekends. There are, however, differences in work/parent role performance. Not surprisingly, individuals are more likely to work during weekdays. The most striking difference is found for working ≥8 hours with 37% of individuals reporting working this amount of time on weekdays compared to 7% on the weekends. Parenting also varies by weekday/weekend, with a higher proportion of parents reporting being involved with parenting during the weekdays than on the weekends (71% vs. 59%). These results may be an indication that parents are more involved with childcare during the school days and are given some sort of respite during the weekends.

As for the covariates, with the exception of time spent in household chores (which is higher during the weekends), there were virtually no differences between weekends and weekdays. It should be noted, though, that there are slightly more individuals interviewed on the weekends who belong to the $25,000-$34,999 income bracket. Furthermore, slightly fewer individuals interviewed on the weekend reported missing data relative to those interviewed on a weekday. These differences are trivial (~1percentage point). The lack of statistically significant differences between status and control variables is expected given the randomization of diary day assessments and the use of EHM weights to adjust the weight of individuals assessed on weekends.

Table 1. Weighted Summary Statistics of Focal Variables for U.S. Adults Ages 18-64 by All Days, Weekdays, and Weekends
American Time Use Survey Eating and Health Module, 2006-2008

	All Days n=29,333	Weekdays n=14,434	Weekends n= 14,799	
	Mean/Proportion			
Exercise Participation	0.22	0.21	0.24	***
Engaged in Sports and Exercise				
Count of 10 Minute Exercise Bouts	2.50 (6.96)	2.09 (5.96)	3.54 (8.88)	***
Full Sample	11.55 (10.90)	10.14 (9.54)	14.51 (12.83)	***
Those who Exercise on Diary Day				
Role Occupancy				
Employment	0.23	0.22	0.23	
Working for Pay				
Not Working for Pay	0.23	0.12	0.49	***
Parenthood	0.26	0.29	0.19	***
Parent of at Least One Child Under the Age of 18 in Household	0.29	0.37	0.08	***
Parent of Young Child (<5 years old)	0.41	0.41	0.41	
Number of Children Under Age 18 in Household	1.87 (0.88)	1.87 (0.87)	1.87 (.89)	
Role Occupancy and Performance				
Employment (For those working for pay)				
No Work on Diary Day	0.29	0.15	0.64	***
<8 Hours Worked on Diary Day	0.34	0.37	0.26	***
≥8 Hours Worked on Diary Day	0.37	0.48	0.10	***
Parenting (For those with at least one child <18 in household)				
Engaged in No Parenting on Diary Day	0.32	0.29	0.41	***
Engaged in Parenting on Diary Day	0.68	0.71	0.59	***
Covariates and Statistical Controls				
Partnership Status				
Single	0.38	0.38	0.38	
Cohabiting	0.04	0.04	0.04	
Married	0.58	0.58	0.58	
Minutes Engaged in Household Chores				
Full Sample	137.90 (149.63)	122.99 (139.52)	175.13 (166.57)	***
Those who Engaged in Household Chores on Diary Day	167.33 (149.14)	150.83 (140.26)	207.05 (161.85)	***
Age	40.46 (12.97)	40.47 (12.96)	40.42 (13.01)	
Gender				
Male	0.49	0.49	0.49	
Female	0.51	0.51	0.51	
Race/Ethnicity				
non-Hispanic White	0.68	0.68	0.68	
non-Hispanic Black	0.12	0.12	0.12	
non-Hispanic Other Race	0.06	0.06	0.05	
Hispanic, Any Race	0.15	0.15	0.15	
Educational Status				
Less than High School	0.13	0.13	0.13	
High School Graduate/GED	0.30	0.30	0.30	
Some College	0.28	0.28	0.28	
Bachelors Degree or More	0.29	0.29	0.29	
Family Income				
Less than $12,500	0.08	0.08	0.08	
$12,500-$24,999	0.11	0.11	0.10	
$25,000-$34,999	0.11	0.11	0.12	**
$35,000-$49,999	0.15	0.15	0.15	
$50,000-$74,999	0.21	0.21	0.20	
$75,000-$99,999	0.14	0.14	0.14	
$100,000+	0.20	0.20	0.20	
Missing Income	0.13	0.14	0.13	*
BMI				
Not Overweight	0.37	0.37	0.37	
Overweight	0.36	0.36	0.35	
Obese	0.28	0.28	0.27	
Missing BMI	0.06	0.06	0.06	
Self-Rated Health	3.59 (1.03)	3.58 (1.03)	3.59 (1.03)	
Missing Self-Rated Health	0.01	0.01	0.01	

Note: Standard deviations in parentheses *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001

Sample Summary Statistics across Role Performance Categorizations

Table 2 provides summary statistics for individuals across work role occupancy and performance groupings. The present discussion will be limited to examining the differences between workers who do not spend time working during the diary day versus those who do. With regards to exercise, those who work for pay, but do not perform the role of worker on the diary day are more likely to exercise than those workers who do spend some time working on the diary day. For those who do exercise, the total count of 10 minute exercise bouts is higher for workers who do not work on the diary day relative to those who do work.

In terms of parental role occupancy and role performance, workers who do not work on the dairy day are more likely to have at least one child under the age of 18 in the household than those who do work on the diary day. Moreover, though a higher proportion of workers who do not work on the diary day engage in parenting than those workers who engage in 8 hours of work or more, they make up a *lower* proportion of those who exhibit parenting behaviors than those who work fewer than 8 hours. This finding is surprising, given that one would expect those who are not working on the diary day to be more likely to engage in parenting than those who engage in any work. A possible explanation is that since workers who spend no time working on the diary day are greatly overrepresented on the weekends, it could be the case that the weekends are also the time when parents are offered respite from parenting.

In sum, who represents the workers who do not work on the diary day? For one, the workers who engage in no work on the diary day are the most likely to exercise and spend more time exercising than any other worker role occupancy and role performance category. Additionally, they are more likely to be parents, but don't seem to be more likely to engage in parenting than those who work fewer than 8 hours. Lastly, a higher proportion of workers who engage in no work are reporting on a weekend diary day.

Table 3 presents summary statistics for individuals across parental role occupancy and performance groupings. Again, the contrast will be between those parents who engage in no parenting vs. those who do. First, those parents who do not participate in parenting on the diary day are both more likely to exercise during the diary day and have a higher count of 10 minute exercise bouts. Relative to parents who engage in parenting, parents who do not parent on the diary day are more likely to be working for pay and are more likely to engage in at least 8 hours of work on the diary day. Not surprisingly, a smaller proportion of parents who do not engage in parenting on the diary day are parents of young children. Further, they have fewer children, on average, relative to parents who do engage in parenting on the diary day. This finding most likely reflects differential demands of parenting, with parents of young children and those with more children finding it necessary to spend time in parenting on any given day. Additionally, parents are more likely to engage in no parenting on the weekends, providing some evidence for some type of respite granting mechanism for parents on the weekend.

To summarize, the parents who do not engage in parenting on the diary day have higher levels of exercise, are more likely to be working for pay (and to work an 8 hour or more work day on the diary day), are less likely to have young children, have fewer children, and are more likely to report no parenting on the weekends. Tables 2 and 3 attempt to provide information on what characterizes the workers and parents who actually engage in work and parenting on the diary day versus workers and parents who do not perform the work and parenting role on the diary day. Though the presentation of these summary statistics does not address selection issues, it does allow for the comparison and contrast of individuals in various different roles occupancy/performance configurations.

Table 2. Weighted Summary Statistics for U.S. Adults Ages 18-64 by Employment Role Performance Groupings
American Time Use Survey Eating and Health Module, 2006-2008

	Not Working for Pay n=6,719	No Work on Diary Day n=9,050	<8 Hrs Worked on Diary Day n=7,054	≥8 Hrs Worked on Diary Day n=6,410
	Mean/Proportion			
Exercise Participation				
Engaged in Sports and Exercise	0.24	0.27	0.21	0.16
Count of 10 Minute Exercise Bouts				
Full Sample	3.02 (7.80)	4.02 (9.49)	2.18 (6.01)	1.18 (3.57)
Those who Exercise on Diary Day	12.66 (11.56)	15.03 (13.07)	10.25 (9.32)	7.25 (5.87)
Role Occupancy				
Parenthood				
Parent of at Least One Child Under the Age of 18 in Household	0.64	0.62	0.38	0.38
Parent of Young Child (<5 years old)	0.21	0.42	0.41	0.41
Number of Children Under Age 18 in Household	1.98 (0.94)	1.84 (0.86)	1.84 (0.86)	1.84 (0.84)
Role Performance				
Parenting (For those with at least one child <18 in household)				
Engaged in No Parenting on Diary Day	0.20	0.37	0.28	0.42
Engaged in Parenting on Diary Day	0.80	0.63	0.72	0.58
Covariates and Statistical Controls				
Partnership Status				
Single	0.41	0.37	0.39	0.34
Cohabiting	0.04	0.04	0.05	0.05
Married	0.55	0.58	0.56	0.61
Minutes Engaged in Household Chores				
Full Sample	193.26 (170.75)	206.98 (176.81)	117.51 (118.40)	57.98 (68.07)
Those who Engaged in Household Chores on Diary Day	221.13 (164.92)	234.54 (170.17)	138.92 (116.61)	80.63 (67.95)
Age	41.93 (14.71)	39.85 (12.65)	39.62 (12.73)	40.53 (11.83)
Gender				
Male	0.36	0.49	0.47	0.62
Female	0.64	0.51	0.53	0.37
Race/Ethnicity				
non-Hispanic White	0.62	0.70	0.69	0.71
non-Hispanic Black	0.15	0.12	0.11	0.10
non-Hispanic Other Race	0.06	0.05	0.06	0.06
Hispanic, Any Race	0.17	0.13	0.14	0.14
Educational Status				
Less than High School	0.22	0.11	0.10	0.09
High School Graduate/GED	0.35	0.30	0.27	0.30
Some College	0.26	0.31	0.29	0.27
Bachelors Degree or More	0.18	0.28	0.34	0.35
Family Income				
Less than $12,500	0.19	0.05	0.06	0.04
$12,500-$24,999	0.16	0.09	0.10	0.09
$25,000-$34,999	0.12	0.11	0.11	0.10
$35,000-$49,999	0.13	0.17	0.15	0.15
$50,000-$74,999	0.17	0.23	0.21	0.22
$75,000-$99,999	0.09	0.15	0.16	0.16
$100,000+	0.13	0.20	0.21	0.24
Missing Income	0.14	0.13	0.13	0.13
BMI				
Not Overweight	0.39	0.37	0.39	0.34
Overweight	0.30	0.36	0.36	0.39
Obese	0.31	0.27	0.25	0.28
Missing BMI	0.07	0.06	0.06	0.05
Self-Rated Health	3.16 (1.21)	3.68 (0.93)	3.71 (0.93)	3.73 (0.93)
Missing Self-Rated Health	0.01	0.01	0.01	0.01
Weekend	0.29	0.62	0.21	0.08
Holiday	0.02	0.04	0.01	0.003

Note: Standard deviations in parentheses *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001

Table 3. Weighted Summary Statistics for U.S. Adults Ages 18-64 by Parenting Role Performance Groupings
American Time Use Survey Eating and Health Module, 2006-2008

	Childless n=14,585	Engaged in No Parenting on Diary Day n=4,676	Engaged in Parenting on Diary Day n=9,972
	Mean/Proportion		
Exercise Participation			
Engaged in Sports and Exercise	0.23	0.21	0.19
Count of 10 Minute Exercise Bouts			
Full Sample	2.72 (7.28)	2.91 (8.23)	1.79 (5.23)
Those who Exercise on Diary Day	11.89 (11.08)	13.75 (13.07)	9.38 (8.50)
Role Occupancy			
Employment			
Working for Pay	0.77	0.87	0.75
Not Working for Pay	0.23	0.13	0.25
Parenthood			
Parent of Young Child (<5 years old)	-	0.27	0.52
Number of Children Under Age 18 in Household	-	1.69 (0.83)	1.96 (0.88)
Role Performance			
Employment (For those working for pay)			
No Work on Diary Day	0.29	0.31	0.29
<8 Hours Worked on Diary Day	0.34	0.26	0.37
≥8 Hours Worked on Diary Day	0.37	0.43	0.33
Covariates and Statistical Controls			
Partnership Status			
Single	0.51	0.15	0.16
Cohabiting	0.05	0.03	0.04
Married	0.44	0.82	0.80
Minutes Engaged in Household Chores			
Full Sample	127.58 (146.38)	137.07 (165.40)	163.34 (146.40)
Those who Engaged in Household Chores on Diary Day	158.90 (147.34)	179.35 (167.97)	180.59 (143.46)
Age	42.09 (14.79)	40.32 (8.77)	36.58 (8.28)
Gender			
Male	0.52	0.61	0.37
Female	0.48	0.39	0.63
Race/Ethnicity			
non-Hispanic White	0.71	0.57	0.66
non-Hispanic Black	0.12	0.13	0.10
non-Hispanic Other Race	0.06	0.06	0.06
Hispanic, Any Race	0.11	0.24	0.18
Educational Status			
Less than High School	0.12	19.09	0.11
High School Graduate/GED	0.32	0.32	0.26
Some College	0.29	0.24	0.27
Bachelors Degree or More	0.27	0.25	0.36
Family Income			
Less than $12,500	0.08	0.08	0.07
$12,500-$24,999	0.11	0.11	0.09
$25,000-$34,999	0.11	0.12	0.10
$35,000-$49,999	0.16	0.14	0.15
$50,000-$74,999	0.21	0.22	0.21
$75,000-$99,999	0.14	0.14	0.15
$100,000+	0.19	0.19	0.23
Missing Income	0.15	0.14	0.10
BMI			
Not Overweight	0.38	0.29	0.39
Overweight	0.35	0.40	0.35
Obese	0.27	0.31	0.27
Missing BMI	0.05	0.06	0.08
Self-Rated Health	3.55 (1.05)	3.57 (1.01)	3.68 (0.96)
Missing Self-Rated Health	0.01	0.02	0.01
Weekend	0.29	0.36	0.25
Holiday	0.02	0.03	0.02

Note: Standard deviations in parentheses *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001

Distribution of Exercise, Working, and Parenting Variables

Before moving to the results from multivariate analyses, it is worth examining the distribution of the time use variables used to construct the dependent variable (i.e. number of 10 minute exercise bouts) as well as the worker and parent role performance variables. Figure 1 presents a histogram of the number of 10 minute exercise bouts across the entire analytic sample. As discussed before, a large percentage of the population (78%) engage in no exercise. For a better visualization of the distribution of time engaged in exercise, Figure 2 displays the distribution of number of 10 minute exercise bouts among those who engage in some exercise on the diary day. Here, we get a better picture of the positive skew in the distribution. Despite the wide range of values of self-reported 10 minute bouts of exercise (0-68), the modal category falls at 6 bouts (or 60 minutes). It is clear that extreme values pull the mean to 11.5 10 minute exercise bouts (115 minutes). By examining the distribution of exercise time, it should be clear that the majority of respondents engage in less than 12 bouts of 10 minute exercise intervals (i.e. 120 minutes of exercise). In sum the results shown in Figures 1 and 2 provides not only justification for using ZINB regression models (presence of both excess zeros), but also presents a more detailed view of the amount of time the analytic sample engages in exercise.

Figure 1

Histogram Depicting Count of 10 Minute Exercise Bouts

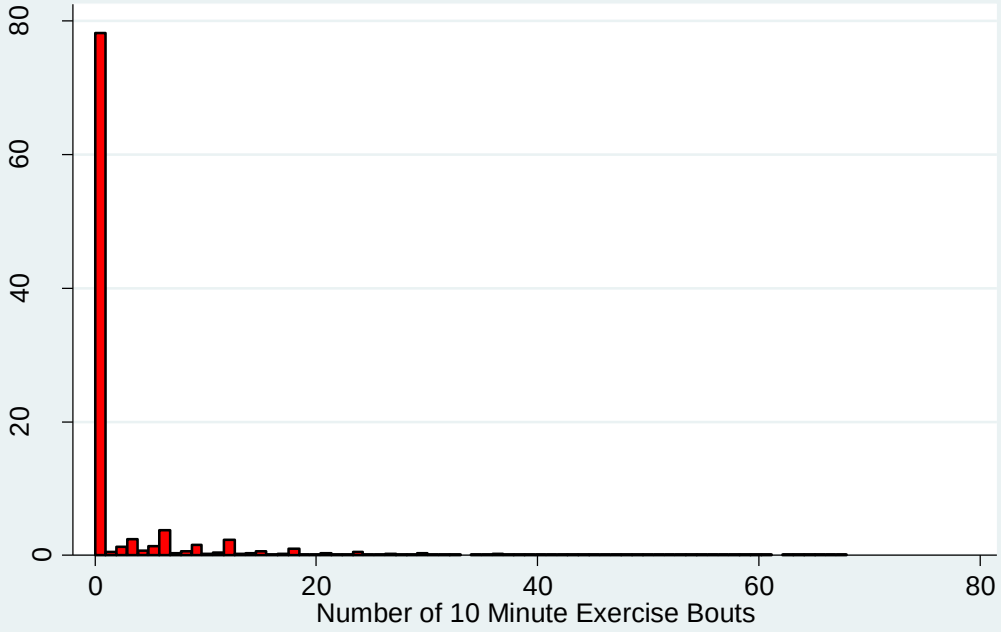
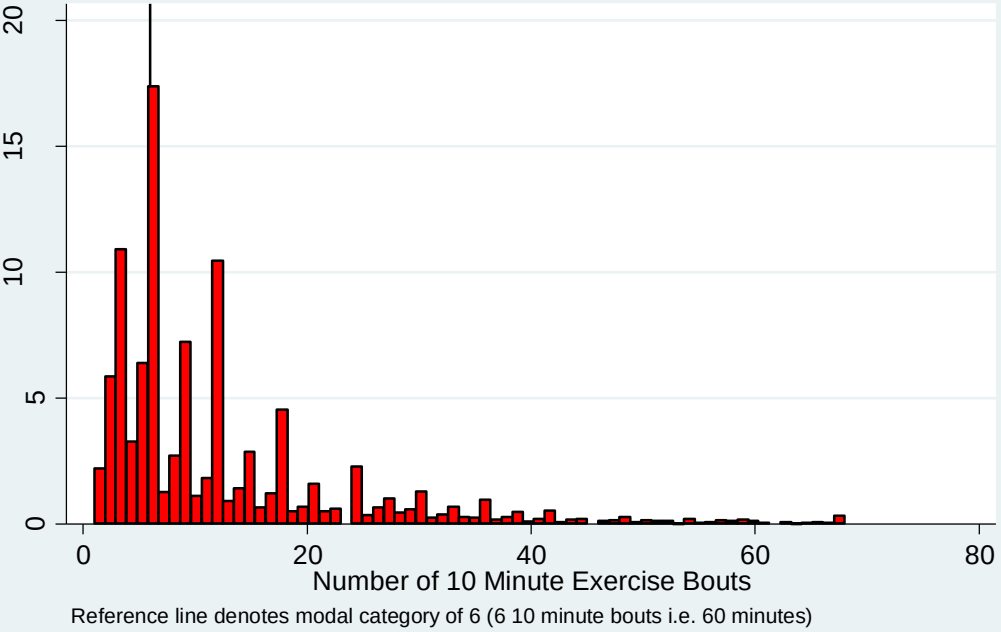


Figure 2

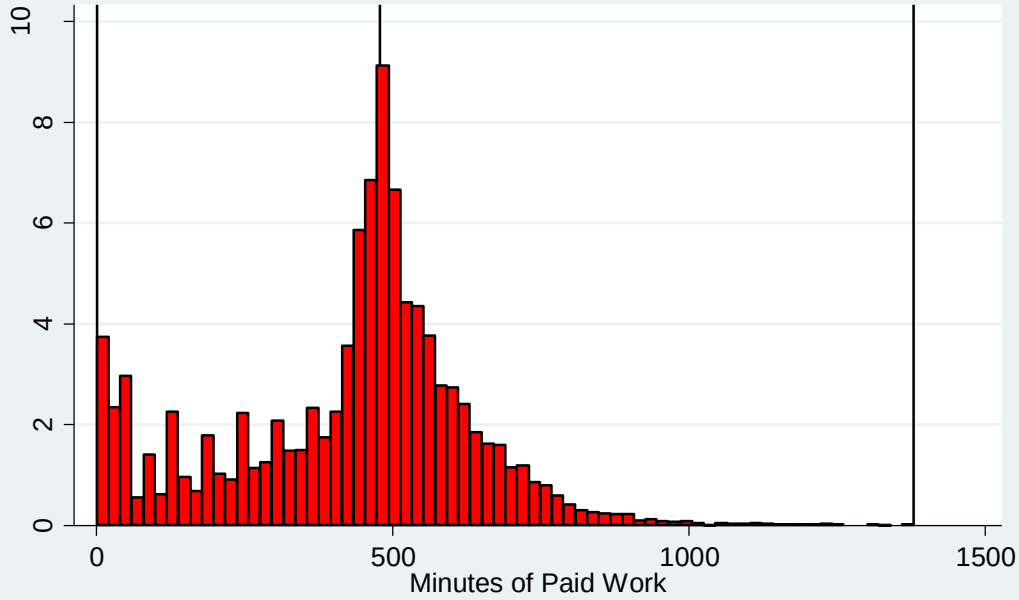
Histogram Depicting Count of 10 Minute Exercise Bouts Among Exercisers



Reference line denotes modal category of 6 (6 10 minute bouts i.e. 60 minutes)

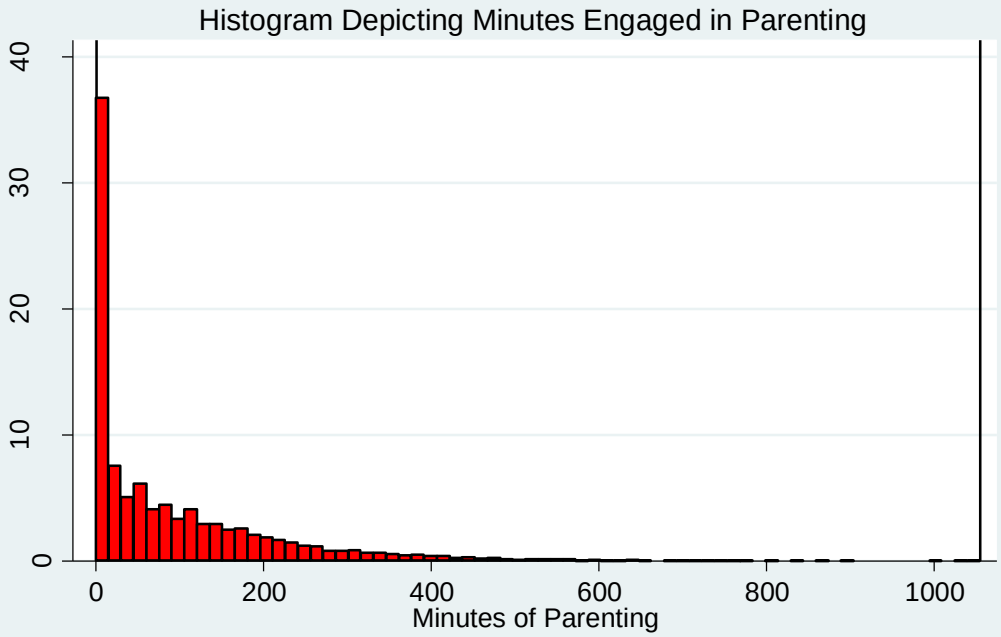
Figure 3 is a histogram of total minutes engaged in working among those who are indeed workers. The vertical lines at the points in the distribution mark the categorization of worker role performance groups (greater than 0 but less than 8hrs worked ; greater than or equal to 8hrs worked). A noticeable, albeit unsurprising, finding from this histogram is that there is more variation among those who work ≥ 8 hours than among those who work < 8 hours. This makes sense given that the max value for those working less than 8 hours is 7.99 (479.99 minutes) hours whereas the max value for those working more than 8 hours is, theoretically, 24 hours (2880 minutes). Based on Figure 3, it should also be clear that my categorization of role performance divides respondents into roughly two equal groups (percentage of the sample who engages in less than 8 hours of work versus those who engage in more than 8 hours of work). Admittedly, equal group partitioning seen in this figure was merely a result of using conventional cut-points of less than and greater than 8 hours.

Figure 3



Lastly, Figure 4 presents a graphical display of the distribution of minutes engaged in parenting among those parents who have children under the age of 18 in the household. Like with Figure 3, I include vertical lines at the points used to generate parental role performance groupings. For parenting, I only distinguish between those who spend no time parenting (i.e. zero minutes) and those who do (> 0 minutes). As the figure indicates, there is a sizeable number of individuals who occupy the role of parent but do not engage in parenting on the diary day. Further, it should be noted that my classification of parental role performance is very crude. There is a great deal of variation with regards to the amount of time parents spend engaged in parenting activities. Given that the focus of this study is to simply differentiate between parental role occupancy and role performance (regardless of time spent performing parenting), my unrefined measure of parental role performance should not be problematic. Unlike for work role performance, my crude categorization of parental role performance did not yield equally sized groups (i.e. parents who engage in no parenting vs. parents who do parent). Indeed, there are many more parents who engage in parenting during the diary day than parents who do not parent.

Figure 4



In summation, the previous figures all provide visualizations of time use variables I use to construct my focal dependent variable (exercise time) and focal predictor variables (work and parental role performance variables). Figure 1 and 2 help to justify my decision to use ZINB regression models, whereas Figures 3 and 4 provide information on the consequences of using the cut-points I chose for grouping respondents in work/parental role performance categories. Though I mask a great deal of variation by generating crude measures of role performance, my focus on simply distinguishing between role occupancy and role performance makes the aforementioned groupings appropriate.

Multivariate Analyses

Table 4 presents parameter estimates for a series of ZINB regression models predicting both likelihood of belonging to the group of individuals who never engage in exercise on a given day (ZI column) and count of 10 minute bouts of exercise (NB column). Model 1 examines the

relationship between worker and parenting role occupancy variables and exercise participation. Results from the ZI column indicate that, net of controls, workers are 34% less likely to never exercise on any given day than those who do not work for pay ({[1-exp(-0.421)]*100}); $p<0.001$). Moreover, results from the NB column indicates that workers participate in a 29% higher count of 10 minute bouts of exercise relative to their non-working peers ({[exp(.256)]*100}); $p<0.001$). When it comes to parenting, results paint a different picture. Relative to individuals without children in the household, parents are less likely to take part in exercise on any given day, as indicated by the positive and significant ZI coefficient. Turning to the NB column, occupying the role of parent is associated with a lower count of 10 minute exercise increments at the alpha-level of .10. Specifically, parents engage in approximately a 6.4% lower count of exercise bouts than their childless counterparts.

Model 2 introduces a dichotomous measure of whether the individual is the parent of a young child and a measure of the total number of children in the household, two additional indicators that provide more detail to the parenting role. Introducing these variables does not drastically alter the relationship between worker role occupancy and exercise. Indeed, the magnitude of the coefficients related to worker role occupancy is virtually the same across models. Though parental role occupancy is still predictive of not engaging in exercise on any given day (ZI coefficient .144, $p<0.001$), the relationship between parental role occupancy and the count of exercise bouts disappears when accounting for the presence of young children (NB coefficient is no longer statistically significant). Instead, the NB coefficient indicates that the presence of young children is associated with an 8% decrease in the count of exercise bouts.

Model 3 incorporates the worker and parent role performance variables for worker into the model while still retaining information on work and parent role occupancy. When compared to those who are not working for pay, individuals who do work for pay but do not perform the working role on the diary day do not differ with regards to participation in exercise net of

statistical controls. For those workers who do engage in work, however, participation in work role activities is negatively associated with both belonging to group of individuals who generally do not exercise (ZI coefficient) and the count of 10 minute exercise bouts (NB coefficient). The likelihood of never engaging in exercise in general is 56% higher for those who work for less than 8 hours on the diary day and is approximately 150% higher for those who work for at least 8 hours on the diary day (ZI coefficients). Similarly, enacting the worker role during the diary day is associated with a drastically higher reduction in the count of 10 minute exercise bouts (28% reduction for those who work less than 8 hours and 54% reduction for those who work at least 8 hours) (NB coefficients).

The distinction between role occupancy and role performance is apparent for parenthood as well. Compared to those without children under the age of 18 in the household, parents who do not participate in parenting do not differ in any meaningful way. Indeed, the small magnitude of the NB coefficient associated with parents who do not engage in parenting on the diary day combined with the liberal alpha-level of .05, I contend that the difference is trivial and attributed to the relatively large sample size. When I consider those who take part in parenting on the diary day, results show that these individuals are less likely to take part in exercise during the diary by a factor of 1.2 relative to their childless peers (ZI coefficient). Further, parenting on the diary day is associated with a 17% reduction in the number of exercise increments compared to those without children (NB coefficient).

To sum up the results, net of all covariates and statistical controls, both work/parental role occupancy and role performance are associated with exercise time in meaningful ways. In the case of work, the relationships vary across role occupancy and role performance. Being a worker is associated with more participation in exercise, whereas performance of the role during the diary day is associated with less time engaged in exercise. Conversely, results show that parental role occupancy and role performance are both negatively associated with exercise.

As noted earlier, a series of sensitivity analyses were conducted to ensure the consistency of my findings. First, to ensure that the aforementioned findings are not an artifact of the scaling of the dependent variable, I estimate the same model across different scalings of the dependent variable. Appendix D presents a series of ZINB regression models with differential scalings of the dependent variable. Results are found to be consistent regardless of scaling. Because of potential reverse causality between BMI and sports/exercise participation, I estimate a model with and without BMI included as a covariate. Appendix E presents parameter estimates for a ZINB regression model with BMI excluded. The parameter estimates for the focal predictor variables do not vary across model specification (i.e. with and without BMI included. Therefore, I chose to retain BMI in the final models because of previous findings that BMI associated with exercise.

In order to include *weekends* as a statistical control, I first had to ensure that the relationship between focal predictor variables did not differ by weekend vs. weekday. In other words, I had to first rule out the possibility that weekend moderated the relationship between focal predictors and exercise. Appendix F presents results of a model including a series of interactions between weekend and the focal predictor variables. The lack of statistically significant interaction terms and the lack of improvement in model fit (as indicated by higher BIC and AIC in the models without interactions), led me to incorporate *weekend* as a control variable, as no moderating effect was found. Across all sensitivity analyses, all models include the same statistical controls as the models presented in Table 4. I present only the ZI and NB coefficients for the focal predictor variables given that these are the findings I am most concerned with.

Table 4. Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 10 Minute Exercise Increments among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008

n=29,233	Model 1		Model 2		Model 3	
	ZI	NB	ZI	NB	ZI	NB
Role Occupancy						
Employment Status (Reference: Not Working for Pay)	-0.421***	0.256***	-0.425***	0.257***		
	(0.051)	(0.038)	(0.051)	(0.038)		
Parental Status (Reference: Childless)	0.152***	-0.066 +	0.144*	-0.074		
	(0.046)	(0.036)	(0.072)	(0.054)		
Number of Children Under the Age of 18			-0.017	0.018		
			(0.032)	(0.024)		
Parent of Young Child(ren) (<5 Years Old)			0.119*	-0.081 +		
			(0.057)	(0.043)		
Role Occupancy and Performance						
Employment (Reference: Not Working for Pay)						
No Paid Work on Diary Day					0.068	0.021
					(0.059)	(0.040)
<8 Hours Worked on Diary Day					0.444***	-0.328***
					(0.062)	(0.043)
≥8 Hours Worked on Diary Day					0.908***	-0.782***
					(0.069)	(0.049)
Parenting (Reference: Childless)						
Engaged in No Parenting Diary Day					0.061	0.098*
					(0.059)	(0.040)
Engaged in Parenting on Diary Day					0.187***	-0.187***
					(0.051)	(0.037)
Statistical Controls						
Partnership Status (Reference: Married)						
Single	0.034	-0.044	0.044	-0.051	0.064	-0.060
	(0.053)	(0.042)	(0.055)	(0.042)	(0.054)	(0.039)
Cohabiting	0.088	0.066	0.091	0.062	0.066	0.09
	(0.123)	(0.085)	(0.123)	(0.085)	(0.124)	(0.073)
Minutes Engaged in Household Chores	-0.0001	-0.001***	-0.0001	-0.001***	0.001***	-0.001***
	(0.001)	(0.0001)	(0.001)	(0.0001)	(0.001)	(0.0001)
Age	-0.012***	0.001	-0.011***	0.001	-0.012***	0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Female	0.443***	-.350***	0.442***	-0.349***	0.459***	-0.320***
	(0.043)	(0.034)	(0.043)	(0.034)	(0.044)	(0.031)
Race/Ethnicity (Reference: Non-Hispanic White)						
Non-Hispanic Black	0.487***	-0.217***	0.485***	-0.216***	0.515***	-0.228***
	(0.074)	(0.065)	(0.074)	(0.065)	(0.075)	(0.059)
Non-Hipanic Other Race	0.148	-0.030	0.144	-0.028	0.148	-0.022
	(0.095)	(0.075)	(0.096)	(0.075)	(0.096)	(0.078)
Hispanic, Any Race	0.060	-0.094 +	0.056	-0.092 +	0.044	-0.081 +
	(0.065)	(0.049)	(0.064)	(0.049)	(0.065)	(0.045)
Education (Reference: High School Grad/GED)						
Less than HS Education	-0.084	-0.020	-0.084	-0.019	-0.064	-0.069
	(0.083)	(0.058)	(0.083)	(0.058)	(0.082)	(0.054)
Some College	0.018	-0.052	0.019	-0.052	0.027	-0.088*
	(0.057)	(0.044)	(0.057)	(0.044)	(0.058)	(0.041)
Bachelor's Degree +	-0.183**	-0.224***	-0.186***	-0.223***	-0.208***	-0.200***
	(0.058)	(0.042)	(0.058)	(0.042)	(0.059)	(0.041)
Family Income (Reference: $35,000-$49,999)						
Less than $12,500	0.237 +	-0.139 +	0.234 +	-0.139 +	0.238 +	-0.122 +
	(0.122)	(0.076)	(0.122)	(0.076)	(0.122)	(0.070)
$12,500-$24,999	0.118	-0.026	0.117	-0.024	0.109	-0.011
	(0.090)	(0.076)	(0.090)	(0.076)	(0.090)	(0.069)
$25,000-$34,999	-0.014	-0.041	-0.016	-0.039	-0.028	-0.012
	(0.090)	(0.069)	(0.090)	(0.069)	(0.091)	(0.059)
$50,000-$74,999	-0.155 +	-0.035	-0.154 +	-0.036	-0.168*	-0.008
	(0.080)	(0.051)	(0.080)	(0.051)	(0.080)	(0.047)
$75,000-$99,999	-0.148 +	-0.032	-0.146 +	-0.032	-0.159 +	0.007
	(0.087)	(0.060)	(0.087)	(0.060)	(0.088)	(0.058)
$100,000+	-0.273**	-0.004	-0.268**	-0.007	-0.300***	0.027
	(0.088)	(0.054)	(0.088)	(0.054)	(0.087)	(0.048)
BMI (Reference: Not Overweight)						
Overweight	0.109*	0.007	0.109*	0.007	0.100*	0.003
	(0.050)	(0.038)	(0.049)	(0.038)	(0.049)	(0.036)
Obese	0.254***	-0.003	0.253***	-0.003	0.248***	-0.006
	(0.060)	(0.044)	(0.060)	(0.043)	(0.060)	(0.041)
Self-Rated Health	-0.181***	0.020	-0.181***	0.020	-0.192***	0.032 +
	(0.023)	(0.018)	(0.023)	(0.018)	(0.023)	(0.016)
Weekend	-0.195***	0.425***	-0.196***	0.425***	0.054	0.185***
	(0.038)	(0.029)	(0.038)	(0.029)	(0.044)	(0.031)
Holiday	-0.328 +	0.462***	-0.329*	0.466***	-0.116	0.243*
	(0.177)	(0.108)	(0.177)	(0.107)	(0.177)	(0.108)
Constant	2.160***	2.238***	2.158***	2.241***	1.158***	2.867***
	(0.140)	(0.114)	(0.140)	(0.114)	(0.129)	(0.094)
Ln α	-0.507***		-0.508***		-0.637***	
	(0.033)		(0.033)		(0.033)	
α	0.602		0.601		0.529	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}p \leq 0.10$; *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$

DISCUSSION

In this paper, I test whether the relationships between work, parenting, and exercise differ depending on whether we examine role occupancy vs. role performance. Guided by both social role theory (particularly the role attachment and the role burden hypotheses) and the time availability perspective, I hypothesized that occupying the role of worker is associated with higher exercise participation while the *performance* of work roles is negatively associated with exercise (*H1* and *H3).* Conversely, I hypothesized that both parental role occupancy and role performance are associated with less time spent in exercise (*H2 and H4*). Findings indicate that whereas work role occupancy seems to predict more exercise engagement, when considering the performance of work, engagement in work during the diary day is associated with less exercise. For parenting, the distinction between role occupancy and role performance did not appear to matter with regards to the direction of the association; both parental role occupancy and role performance are negatively associated with exercise. Therefore, results provide support for all hypotheses. Ultimately, it appears that the distinction between role performance and role occupancy does matter, but only for the relationship between work and exercise.

Though research on work/parenting roles and health/health behaviors is not new and though my results are in line with past research examining work/parenting role occupancy and exercise (Nomaguchi and Bianchi 2004; Taniguchi and Shupe 2012), the present analysis makes a contribution to the literature on social roles and their influence on health behaviors, particularly exercise. To my knowledge, this study is the first to make an explicit distinction between work/parenting *role occupancy* and *role performance* in an examination of the determinants of exercise. In doing so, this study contributes to the burgeoning research associating social roles related to work and family to health behaviors like sleep (Burgard and Ailshire 2013), health services utilization (Christiaens and Bracke 2014), and relaxation/leisure (Bianchi et al. 2006). This study will hopefully encourage researchers to distinguish between role occupancy and role

performance when possible in order to more fully understand the relationships between roles and health behaviors.

Limitation and Future Directions

The present analysis is not without its share of limitations. My choice on how to operationalize variables warrants particular consideration. Though I leverage the time diary data in the ATUS to generate my indicators of role performance (no time vs. anytime for parenting; no time vs. <8 hours vs. ≥ 8 hours for work), these are very crude categorizations and do not likely tell the full story of how work/parent role performance is associated with exercise. How does engaging in parenting in 5 hours of parenting matter differently for exercise than engaging in 7 hours of parenting? The operationalization of parenting role performance in the present study does not provide an answer to that question. Another way to capture role performance would be to measure the amount of time engaged in each role (Taniguchi and Shupe 2012). A natural next step would be to extend the present analysis by operationalizing work and parenting role performance as total time engaged in role related activities. Such a study would provide a more clear view of how variations in role performance matter differently for exercise participation.

Related to operationalization and measurement issues is the current study's exclusive focus on primary activities. Because there tends to be significant overlap between activities (e.g. folding laundry while watching television), many of the time use estimates for activities are underestimations. This means that my role performance variables are not able to capture every person who does indeed engage in an activity related to a role. This is particularly problematic for engaging in activities associated with parenting. Classifying parenting as a primary activity is left to the discretion of ATUS coders and is often based on direct interaction with household children. If children are present but the respondent is engaged in another activity (e.g. watching television, sewing), they would not be coded as having engaged in parenting. For a clearer example, parents who report cooking as a primary activity but are simultaneously keeping an eye on their children

would not be picked up as engaging in parenting in the current analysis. Future studies should move beyond distinguishing between primary and secondary activities for a more expansive measure of role performance.

Worker/parent roles and their associated activities are important to consider, but there are a number of other roles that individuals occupy in society that may impact time spent in exercise. Similarly, the performance of these roles may also matter. One example is occupying the role of spouse/partner. Prior research has linked being a spouse to health (e.g. Waite 1995), and so it is important to consider how being partnered may shape exercise. Though I include partnership status as a statistical control, my decision was driven mainly by the inability to adequately capture indicators of partner role performance. Ideally, future data collection efforts will make efforts to include indicators of partner role performance for use in analyses linking social roles to health behaviors. Another example of a role not examined in the present analysis is that of noncustodial parent. This study would have benefited from a broader consideration of parenting.

In addition to the measurement issues regarding the variables discussed above, a number of other factors may contribute to the determination of engagement in exercise. For instance, when considering whether individuals engage in exercise and for how long they participate, I argue that people make a tradeoff between activities linked to higher order roles such as worker and parent. However, this argument rests on the assumption that exercise is not as highly valued as parenting and working. Those who identify as athletes and/or athletic may prioritize exercise and take it upon themselves to assure that they have a block of time carved out each day to engage in exercise regardless of other role demands. Closely related is the notion that some individuals prefer to exercise whereas others may not. In other words, the lack of participation in exercise could be due to individuals preferring to do other things with their free time.

Somewhat related to preference for exercise is the ability to compartmentalize one's day. Defined as the degree to which individuals can keep separate the activities related to each distinct

status (Turner 1978), compartmentalization could serve as an important determinant of engagement in exercise in that people who are more adept at preventing spillover of one activity into another may be more likely to exercise (Taniguchi and Shupe 2012). Indeed, past research on compartmentalization and leisure activity has found that higher compartmentalization is associated with a higher perception of free time, which in turn leads to higher levels of engagement in leisure activities (Mattingly and Bianchi 2003). For those who prefer to exercise, increased compartmentalization may influence their exercise time. The current study would have benefited from an indicator of those who identify as athletes or an indicator of exercise preference as well as indices of compartmentalization in order to investigate the alternative hypothesis that individuals who want to engage in exercise do so regardless of other demands of social roles

Next, the issue of selection is one that I am not able to fully address in this paper. Specifically, among those who occupy the role of worker and parent, who selects into working and parenting? Though I provide descriptive statistics that show some of the characteristics of those workers and parents that do work and parent on the diary day, there may be other selection mechanisms that I am unable to account for in the present analysis.

Another limitation that arises is that certain physical activities are determined by geographic region, season, and access to resources. Whereas walking and running can be done with relative ease in most environments, participating in water sports is conditional on having access to a body of water or a pool. Similarly, use of cardiovascular or weight machines is conditional on proximity to a gym and possession of a gym membership. Studies in the future would benefit from incorporating spatial indicators and contextual variables when considering determinants of exercise.

Whereas the previously discussed limitations are due to measurement issues, another limitation emerges as a result of model specification. The present study presents an additive model, in which the combined effect of sociodemographic characteristics such as gender,

race/ethnicity, social class, and age are considered. Such modeling makes the strong assumption that the relationships between focal predictors and the outcome variable in question are the same across levels of covariates. Given a rapidly growing literature that the relationships between work/family roles and engagement in exercise *differs* by gender (Bird and Fremont 1991; Bianchi et al. 2006; Nomaguchi and Bianchi 2004; Taniguchi and Shupe 2012), future studies should specify interactive models that allow for the examination of the moderating effects of gender. Moreover, future work should also consider the moderating effects of age, race/ethnicity, and social class.

Lastly, the cross-sectional nature of the data set prevents the determination of any causal claims regarding the relationships between work/parental status, role performance, and participation in physical activity. In order to more fully understand the relationship between social roles and exercise, it is critical to use longitudinal data. By following individuals over time, it would become possible to establish a causal link between role status/engagement and exercise.

Despite these limitations, the current study provides evidence for the importance of separating status and role performance when examining health behaviors. Future studies in this area should provide distinctions between status and performance in order to gain a more nuanced understanding of the connection between statuses, roles, and health.

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APPENDIX A

Weighted Means and Proportions of Focal Variables for ATUS Full Sample, EHM Respondents, and Analytic Sample, 2006-2008

	ATUS Sample n=37,914	EHM Sample n=37,832	Analytic Sample n= 29,333	
	Mean/Proportion			
Exercise Participation				
Engaged in Sports and Exercise	0.24	0.24	0.22	***
Count of 10 Minute Exercise Bouts				
Full Sample	2.78 (7.29)	2.78 (7.29)	2.50 (6.96)	***
Those who Exercise on Diary Day	11.74 (10.91)	11.74 (10.91)	11.55 (10.90)	***
Role Occupancy				
Employement Status				
Working for Pay	0.65	0.65	0.77	***
Not Working for Pay	0.35	0.35	0.23	***
Parental Status				
Parent of at Least One Child Under the Age of 18 in Household	0.30	0.30	0.38	***
Parent of Young Child (<5 years old)	0.44	0.44	0.44	
Number of Children Under Age 18 in Household	1.87 (0.88)	1.87 (0.88)	1.87 (0.88)	
Role Performance				
Employment (For those working for pay)				
No Work on Diary Day	0.30	0.30	0.29	
<8 Hours Worked on Diary Day	0.34	0.34	0.34	
≥8 Hours Worked on Diary Day	0.36	0.36	0.37	
Parenting (For those with at least one child <18 in household)				
Engaged in No Parenting on Diary Day	0.33	0.33	0.32	
Engaged in Parenting on Diary Day	0.67	0.67	0.68	
Covariates and Statistical Controls				
Partnership Status				
Single	0.42	0.42	0.38	***
Cohabiting	0.04	0.04	0.04	
Married	0.54	0.54	0.58	***
Minutes Engaged in Household Chores				
Full Sample	138.17 (149.73)	138.17 (149.73)	137.90 (149.63)	***
Those who Engaged in Household Chores on Diary Day	168.91 (149.05)	168.91 (149.05)	167.33 (149.14)	***
Age	44.13 (18.25)	44.13 (18.25)	40.46 (12.97)	***
Gender				
Male	0.48	0.48	0.49	
Female	0.52	0.52	0.51	
Race/Ethnicity				
non-Hispanic White	0.70	0.70	0.68	
non-Hispanic Black	0.12	0.12	0.12	
non-Hispanic Other Race	0.05	0.05	0.06	
Hispanic, Any Race	0.14	0.14	0.15	
Educational Status				
Less than High School	0.19	0.19	0.13	***
High School Graduate/GED	0.30	0.30	0.30	
Some College	0.25	0.25	0.28	***
Bachelors Degree or More	0.26	0.26	0.29	***
Family Income				
Less than $12,500	0.09	0.09	0.08	
$12,500-$24,999	0.13	0.13	0.11	
$25,000-$34,999	0.12	0.12	0.11	
$35,000-$49,999	0.15	0.15	0.15	
$50,000-$74,999	0.20	0.20	0.21	
$75,000-$99,999	0.13	0.13	0.14	
$100,000+	0.18	0.18	0.20	
Missing Income	0.15	0.15	0.13	**
BMI				
Not Overweight	0.39	0.39	0.37	**
Overweight	0.35	0.35	0.36	
Obese	0.26	0.26	0.28	**
Missing BMI	0.06	0.06	0.06	
Self-Rated Health	3.52 (1.05)	3.52 (1.05)	3.59 (1.03)	**
Missing Self-Rated Health	0.01	0.01	0.01	

Note: Standard Deviations in Parentheses *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001

APPENDIX B

Weighted Proportions of Work and Parenting Status by Age Range, American Time Use Survey Eating and Health Module, 2006-2008

Age Range	Proportion Employed	Proportion with Children
15-17	0.33	0.01
18-24	0.73	0.16
25-29	0.82	0.44
30-34	0.80	0.62
35-39	0.82	0.71
40-44	0.82	0.64
45-49	0.82	0.43
50-54	0.81	0.22
55-59	0.73	0.08
60-64	0.54	0.02
65-69	0.30	0.01
70-74	0.20	0.01
75-79	0.11	0.01
80-85	0.05	0.01

APPENDIX C

Sports Exercise and Recreation
(Metabolic Equivalent (MET) Values in Parentheses)

Doing Aerobics	(6.83)
Playing Baseball	(5.00)
Playing Basketball	(8.00)
Biking	(8.00)
Boating	(4.64)
Bowling	(3.00)
Climbing, Spelunking, Caving	(9.50)
Dancing	(4.50)
Participating in Equestrian Sports	(5.33)
Fencing	(6.00)
Fishing	(4.50)
Playing Football	(8.00)
Golfing	(3.75)
Doing Gymnastics	(4.00)
Hiking	(6.00)
Playing Hockey	(8.00)
Hunting	(4.50)
Participating in Martial Arts	(10.00)
Playing Racquet Sports	(8.50)
Participating in Rodeo Competitions	(6.00)
Rollerblading	(6.00)
Playing Rugby	(10.00)
Running	(7.50)
Skiing, Ice Skating, Snowboarding	(7.00)
Playing Soccer	(7.00)
Softball	(5.00)
Using Cardiovascular Equipment	(8.00)
Vehicle Touring/Racing	(3.30)
Playing Volleyball	(5.50)
Walking	(3.80)
Participating in Water Sports	(5.22)
Weightlifting/Strength Training	(3.00)
Wrestling	(6.00)
Doing Yoga	(3.00)
Playing Sports (not classified)	(5.10)

Paid Work/Income Generating Activities

Work, Main Job
Work, Other Job
Security Procedures related to Work
Waiting Associated with Working
Working, (not classified)
Work and Work-Related Activities (not classified)
All Travel Associated with Paid Work

Parenting

Physical Care for Household Children
Reading to/with Household Children
Playing with Household Children, not sports
Arts and Crafts with Household Children
Playing Sports with Household Children
Talking with/Listening to Household Children

Helping/Teaching Household Children (not related to education)
Organization and Planning for Household Children
Looking after Household Children as a Primary Activity
Attending Household Children's Events
Waiting for/with Household Children
Picking up/Dropping off Household Children
Caring for and helping Household Children (not classified)
Helping Household Children with Homework
Household Children's School Conferences/Meetings
Home Schooling of Household Children
Waiting Associated with Household Children's Education
Providing Medical Care to Household Children
Obtaining Medical Care for Household Children
Waiting Associated with Household Children's Health
Activities Related to Household Children (not classified)
All Travel Associated with Caring for Household Children

Household Chores

Interior Cleaning
Laundry
Sewing, Repairing, and Maintaining Textiles
Storing Interior Household Items (including food)
Housework (not classified)
Food and Drink Preparation
Food Presentation
Kitchen and Food Cleanup
Interior Arrangement, Decoration, and Repairs
Building and Repairing Furniture
Heating and Cooling
Interior Maintenance, Repair, and Decoration
Exterior Cleaning
Exterior Repair, Improvements, and Decoration
Lawn, Garden, and Houseplants
Ponds, Pools, and Hot Tubs
Lawn and Garden, (not classified)
Care for Animals and Pets (not veterinary care)
Vehicle Repair and Maintenance (by self)
Appliance and Tool Set-Up, Repair, and Maintenance (by self)
Financial Management
Household Personal Organization and Management
Household Mail and Messages
Household E-mail
Home Security
Household Management (not classified)
Household Activities (not classified)
Grocery Shopping
Purchasing Gas
Purchasing Food (not groceries)
Shopping Except Groceries, Food, and Gas
Waiting Associated with Shopping
All Travel Associated with Household Chores

APPENDIX D

Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 15 Minute Exercise Increments among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008
n=29,233

	ZI	NB
Role Occupancy and Performance		
Employment (Reference: Not Working for Pay)		
No Paid Work on Diary Day	0.065	0.027
	(0.060)	(0.041)
<8 Hours Worked on Diary Day	0.426***	-0.336***
	(0.063)	(0.044)
≥8 Hours Worked on Diary Day	0.861***	-0.816***
	(0.070)	(0.051)
Parenting (Reference: Childless)		
Engaged in No Parenting Diary Day	0.065	0.102*
	(0.060)	(0.042)
Engaged in Parenting on Diary Day	0.176***	-0.190***
	(0.052)	(0.039)
Ln α	-0.629***	
	(0.039)	
α	0.533	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}$p≤0.10; *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001
Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, BMI, self-rated health, weekend, and holiday

Zero-Infla
among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008
n=29,233

	ZI	NB
Role Occupancy and Performance		
Employment (Reference: Not Working for Pay)		
No Paid Work on Diary Day	0.066	0.027
	(0.060)	(0.041)
<8 Hours Worked on Diary Day	0.416***	-0.335***
	(0.064)	(0.044)
≥8 Hours Worked on Diary Day	0.828***	-0.818***
	(0.071)	(0.052)
Parenting (Reference: Childless)		
Engaged in No Parenting Diary Day	0.069	0.101*
	(0.060)	(0.041)
Engaged in Parenting on Diary Day	0.166**	-0.198***
	(0.052)	(0.038)
Ln α	-0.742***	
	(0.043)	
α	0.476	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}$p≤0.10; *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001
Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, BMI, self-rated health, weekend, and holiday

Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 25 Minute Exercise Increments among U.
n=29,233

	ZI	NB
Role Occupancy and Performance		
Employment (Reference: Not Working for Pay)		
No Paid Work on Diary Day	0.066	0.023
	(0.061)	(0.040)
<8 Hours Worked on Diary Day	0.409***	-0.332***
	(0.064)	(0.043)
≥8 Hours Worked on Diary Day	0.809***	-0.799***
	(0.072)	(0.060)
Parenting (Reference: Childless)		
Engaged in No Parenting Diary Day	0.071	0.096*
	(0.060)	(0.040)
Engaged in Parenting on Diary Day	0.162**	-0.189***
	(0.053)	(0.037)
Ln α	-0.941***	
	(0.048)	
α	0.390	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}$p≤0.10; *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001
Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, BMI, self-rated health, weekend, and holiday

Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 30 Minute Exercise Increments among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008
n=29,233

	ZI	NB
Role Occupancy and Performance		
Employment (Reference: Not Working for Pay)		
No Paid Work on Diary Day	0.072	0.033
	(0.064)	(0.046)
<8 Hours Worked on Diary Day	0.377***	-0.364***
	(0.068)	(0.049)
≥8 Hours Worked on Diary Day	0.695***	-0.924***
	(0.077)	(0.060)
Parenting (Reference: Childless)		
Engaged in No Parenting Diary Day	0.088	0.110*
	(0.064)	(0.048)
Engaged in Parenting on Diary Day	0.132**	-0.224***
	(0.060)	-0.044
Ln α	-0.602***	
	(0.059)	
α	0.548	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}$p≤0.10; *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001
Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, BMI, self-rated health, weekend, and holiday

APPENDIX E

Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 10 Minute Exercise Increments among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008, BMI Excluded

n=29,233	Model 1		Model 2		Model 3	
	ZI	NB	ZI	NB	ZI	NB
Role Occupancy						
Employment Status (Reference: Not Working for Pay)	-0.430***	0.256***	-0.430***	0.257***		
	(0.051)	(0.038)	(0.051)	(0.038)		
Parental Status (Reference: Childless)	0.159***	-0.066 $^{+}$	0.159***	-0.074		
	(0.046)	(0.036)	(0.046)	(0.053)		
Number of Children Under the Age of 18			-0.016	0.018		
			(0.030)	(0.023)		
Parent of Young Child(ren) (<5 Years Old)			0.118*	-0.087*		
			(0.053)	(0.043)		
Role Occupancy and Performance						
Employment (Reference: Not Working for Pay)						
No Paid Work on Diary Day					0.010	0.027
					(0.059)	(0.040)
<8 Hours Worked on Diary Day					0.370***	-0.323***
					(0.061)	(0.042)
≥8 Hours Worked on Diary Day					0.824***	-0.771***
					(0.068)	(0.048)
Parenting (Reference: Childless)						
Engaged in No Parenting Diary Day					0.073	0.098*
					(0.058)	(0.040)
Engaged in Parenting on Diary Day					0.191***	-0.187***
					(0.051)	(0.037)
Ln α	-0.507***		-0.508***		-0.635***	
	(0.033)		(0.033)		(0.033)	
α	0.602		0.602		0.530	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}$p≤0.10; *p≤ 0.05; **p≤ 0.01; ***p≤ 0.001

Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, self-rated health, weekend, and holiday

APPENDIX F

Zero-Inflated Negative Binomial Regression Model Parameter Estimates of Exercise Engagement and Count of 10 Minute Exercise Increments among U.S. Adults Ages 18-64, American Time Use Survey Eating and Health Module 2006-2008, BMI Excluded
n=29,233

	ZI	NB
Work and Parenting Role Performance Variables		
Employment (Reference: Not Working for Pay)		
No Paid Work on Diary Day	0.155*	0.108*
	(0.094)	(0.056)
<8 Hours Worked on Diary Day	0.521***	-0.392***
	0.079)	(0.054)
≥8 Hours Worked on Diary Day	0.912***	-0.780***
	(0.081)	(0.056)
Parenting (Reference: Childless)		
Engaged in No Parenting Diary Day	0.236*	0.053
	(0.107)	(0.075)
Engaged in Parenting on Diary Day	0.243*	-0.271***
	(0.104)	(0.075)
Weekend x Role Performance Interactions		
Weekend x No Paid Work on Diary Day	-0.215	-0.110
	(0.115)	(0.075)
Weekend x <8 Hours Worked on Diary Day	-0.312	0.256
	(0.113)	(0.078)
Weekend x ≥8 Hours Worked on Diary Day	0.221	0.025
	(0.157)	(0.118)
Weekend x Engaged in No Parenting on Diary Day	-0.434	0.013
	(0.141)	(0.042)
Weekend x Engaged in Parenting on Diary Day	-0.176	0.110
	(0.143)	(0.098)
Ln α	-0.649***	
	(0.033)	
α	0.522	

Note: Parameters represent coefficients provided by regression equations. Standard Errors are in parentheses. $^{+}p \leq 0.10$; $*p \leq 0.05$; $**p \leq 0.01$; $***p \leq 0.001$

Models fully adjusted for partnership status, household chores, age, gender, race/ethnicity, education, family income, BMI, self-rated health, weekend, and holiday.

Model Fit Statisitcs	No Interactions	Interactions
BIC	$4.97 \times E^{11}$	$4.95 \times E^{11}$
AIC	$4.97 \times E^{11}$	$4.95 \times E^{11}$