



Emerging adults without a driver's license engage in more transportation-related physical activity to school/work in certain environmental contexts



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ABSTRACT

The aim was to examine the moderation effect of driving licensure status on the association between different environmental contexts and transportation-related physical activity to and from school and/or work (TPA-SW) among emerging adults. The data were from Wave 4 ($n = 2026$, year 2013) of the NEXT Generation Health Study, an annual assessment of a nationally representative cohort across the nine U.S. Census Divisions. The outcome variable, TPA-SW, was derived from walking or cycling as modes of travel to and from school and/or work. Environmental context variables included residence, college attendance, and work status. Driving licensure status indicated whether or not participants had an independent driver's license. Poisson regression models, adjusted for potential confounders, were used to test interactions between environmental context and driving licensure. There were significant interactions between environmental context and licensure. Interaction contrasts indicated that participants who did not have a driver's license engaged in more TPA-SW than their licensed counterparts if they were living at home ($\beta = 1.10$, $p < 0.001$), not attending school ($\beta = 0.73$, $p < 0.001$), attending a technical school/community college ($\beta = 1.13$, $p < 0.001$), working 1–30 hours/week ($\beta = 0.69$, $p < 0.001$), or working 30+ hours/week ($\beta = 1.12$, $p < 0.001$). Among non-workers, those without a license engaged in less TPA-SW than participants with a license ($\beta = -0.22$, $p = 0.05$). Among emerging adults in certain environmental contexts, delayed driver licensing may result in more physical activity with the possible tradeoff of less transportation mobility.

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1. Introduction

Emerging adulthood is a period of human development between late adolescence and young adulthood, usually considered the ages of 18–25 (Arnett, 2000; Arnett, 2007). This period of time is often accompanied by declining levels of physical activity (Caspersen et al., 2000; Gordon-Larsen et al., 2004; Nelson et al., 2008; Van Dyck et al., 2015). However, using physically active modes of transportation could contribute to higher levels of moderate-to-vigorous physical activity (Sisson and Tudor-Locke, 2008; WHO, 2015). Findings from Sisson and Tudor-Locke (2008) suggested that college students who commuted by bicycle spent as much as 70% more time engaged in moderate-to-vigorous physical activity than those who commuted by motor vehicle. Similarly, Chaix et al. (2014) indicated that older adults who traveled by walking

or cycling spent more time engaged in moderate-to-vigorous physical activity than those who used a motor vehicle.

In general, physical activity has several possible health benefits including weight moderation and lower risk of developing high blood pressure, Type 2 diabetes, and cardiovascular disease (CDC, 2015a; NHLBI, 2015; Warburton et al., 2006). Transportation-related physical activity (TPA) itself could benefit cardiovascular health (Hamer and Chida, 2008; Gordon-Larsen et al., 2009; Bopp et al., 2015) and lower the odds of being overweight or obese (Frank et al., 2004; Lindström, 2008; Gordon-Larsen et al., 2009; Bere et al., 2011). This association might be relevant to emerging adults, who are at high risk of weight gain (Burke et al., 1996; Greaney et al., 2009). In contrast to active transportation, routine motor vehicle travel has been associated with higher odds of obesity (Frank et al., 2004; Qin et al., 2012; McCormack and Virk, 2014).

Most studies that have analyzed the TPA habits of emerging adults focus on college students while few have examined a sample inclusive of non-students and working young adults (Simons et al., 2014). For example, a study of Belgian students in their last year of high school and

Abbreviations: TPA, Transportation-related physical activity; TPA-SW, Transportation-related physical activity to and from school and/or work.

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second year of college found that active transportation habits did not change significantly when they moved from their family's house to their own residence near campus (Van Dyck et al., 2015). Other studies indicated that the university campus itself might enable TPA engagement (Balsas, 2003; Sisson and Tudor-Locke, 2008; Greaney et al., 2009; Bopp et al., 2011). A shortage or high cost of parking space could encourage active travel as well (Greaney et al., 2009; Bopp et al., 2011; Simons et al., 2014). In one of the few studies on emerging adults who work, Gordon-Larsen et al. (2005) found that those who worked part-time were more likely than those who worked full-time to commute to their job by physically active means, yet most working young adults commuted by car.

Another possible determinant of transportation is access to a vehicle for personal use (Molina-García et al., 2010; Simons et al., 2014). Studies have suggested that vehicle access facilitates motorized travel over active transportation among young adults (Molina-García et al., 2010; Simons et al., 2014). A driver's license could serve as a measurement proxy for vehicle access because a license allows the independent, personal use of a motor vehicle if one is available. Licensure may encourage independent car travel among emerging adults whereas non-licensed individuals need to rely on other people if they want to commute by motor vehicle (Simons et al., 2014). Reasons that emerging adults might delay their licensure include the availability of transportation from other people and the financial costs of a personal vehicle (Schoettle and Sivak, 2014; Tefft et al., 2014). In a study of older adults, having a driver's license was negatively associated with walking transportation and positively associated with car travel (Frank et al., 2010). Another study reported that licensure was associated with less TPA among 16–18 year old adolescents (Grow et al., 2008). Hence, obtaining a license to drive might improve transportation mobility, but it may also reduce transportation-related physical activity. Few studies have examined the possible association between licensure status and young adult TPA.

To study this topic further, we examined potential moderation effects of driving licensure status (licensed vs. not licensed) on the cross-sectional association between environmental context and TPA to and from school/and or work. The analysis of a nationally representative sample extends previous research on college students by including emerging adults who were not attending traditional four-year universities.

2. Methods

2.1. Data source and sampling

We analyzed data from Wave 4 ($n = 2026$) of the NEXT Generation Health Study. The NEXT Study is a seven-year, annual assessment of a nationally representative cohort across the nine U.S. Census Divisions. Assessments began when participants were in 10th grade during the 2009–2010 school year. In Wave 4 (mean age = 19.16 years, SE = 0.02 years), surveys were completed during the 2012–2013 academic year, which was the cohort's first year after high school. The sampling strategy is described in other papers (Hingson et al., 2013; Li et al., 2014). Among participants who were less than 18 years old, parents gave informed consent and the participants provided assent. Participants who were at least 18 years old at any point in the study provided consent. The protocol for the study was approved by the Institutional Review Board of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

2.2. Transportation-related physical activity

Transportation-related physical activity to and from school and/or work (TPA-SW), the outcome variable, was measured with two separate items. One asked participants how many days in a typical week (0–7) they walked to and from school and/or work. The other item

asked how many days in a typical week (0–7) they cycled to and from school and/or work. Responses were summed resulting in a possible range of 0–14 days per week. About 2.5% of the sample had a value greater than seven, which we coded as seven days/week. The final value, with a possible range of 0–7, estimated the number of days per week typically engaged in TPA-SW.

2.3. Demographics

Race/ethnicity was categorized into four groups: white, African-American, Hispanic, or other. Family affluence was categorized as low, moderate, or high according to the Family Affluence Scale (Currie et al., 2008). Parental education was the highest level of education attained by either parent (from the parent report) and categorized as high school diploma/GED or less, some college education, or bachelor's degree or more.

2.4. Weight status

BMI was calculated using participants' self-reported height in inches and self-reported weight in pounds (CDC, 2015b). Weight status categories were based on age appropriate guidelines from the United States Centers for Disease Control and Prevention (CDC, 2014; CDC, 2015b).

For participants younger than 20 years old, we used percentile cutoffs by age and sex as recommended by the CDC (CDC, 2014; Barlow and Committee, 2007). Underweight was a BMI < 5th percentile; normal weight was a BMI \geq 5th and <85th percentiles; overweight was a BMI \geq 85th and <95th percentiles; and obese was a BMI \geq 95th percentile.

For participants who were 20 or older, we used the BMI cutoffs recommended by the CDC for twenty-and-over adults (CDC, 2015b). A BMI < 18.5 was categorized as underweight; BMI \geq 18.5 and <25.0 was normal weight; BMI \geq 25.0 and <30 was overweight; and BMI \geq 30 was obese.

2.5. Driving licensure status

Participants were asked if they had an independent driver's license. Response choices included the following: no license or permit, a learner's permit for classroom education, a learner's permit for supervised practice driving, or a license allowing independent, unsupervised driving. The responses were dichotomized: licensed (having a license that allows independent driving) or not licensed (having no license/permit or having a learner's permit for driver's education).

2.6. Residence

Individuals were asked where they currently lived, and the responses were placed into three categories: at home/with relatives, in their own place (rented room or apartment), or on a college campus (school dormitory/residence hall or fraternity/sorority house).

2.7. College attendance

Participants were asked if they were currently attending school and if so, which type of school they were attending. The responses were placed into three categories: not attending school, attending a technical school/community college, or attending a four-year college/university.

2.8. Work status

Work status was measured as the number of hours per week working in paid and/or unpaid jobs. The responses were placed into three categories: not working, working 1–30 hours/week, or working at least 30 hours/week.

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