Psychosocial and environmental correlates of active commuting for university students

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Abstract

Objective. To examine psychosocial and environmental correlates of active commuting to university (ACU) and explore its association with overall physical activity among college students.

Methods. The sample included 518 students (mean 22.4 years; 59.7% female) from two universities in Valencia, Spain. Weekly estimations of energy expenditure from ACU and total physical activity were obtained. Socio-economic status, self-efficacy, barriers to active transport, access to car and motorbike, access to public transport, walking and cycling facilities and distance to university were assessed. Data were collected April and May of 2009, using a self-administered survey. A structural equation model was used to analyze associations among variables.

Results. ACU was inversely correlated with access to private motorized transport (car or motorbike). Perceptions of physical self-efficacy and walking and cycling facilities were positively associated with ACU, while planning/psychosocial barriers were negatively associated. Multivariate modeling explained 19% of variance in ACU. ACU was not related to total daily physical activity.

Conclusions. Both psychological and environmental variables were significant correlates of ACU. Present findings provide an empirical basis for interventions to increase active transport among university students.

Introduction

Commuting to university represents an opportunity to incorporate physical activity (walking or cycling) into students’ daily routines (Sisson and Tudor-Locke, 2008). Identifying correlates of this behavior can provide an empirical basis for interventions. Research on active transport to school has explored factors related to walking and cycling of youth. The most consistent correlates were parents’ socioeconomic status, psychosocial factors (perceived barriers), use of motorized transport, neighborhood characteristics (sidewalks, traffic) and distance to school (e.g., Babey et al., 2009; Forman et al., 2008). Some studies in youth show active transport to school is associated with higher overall physical activity compared with those using motorized transport (e.g., Davison et al., 2008).

The purpose of the present study was to evaluate a multi-level model of correlates of active commuting in college students that includes demographic, psychosocial and environmental factors. The study evaluated whether active commuting to university was associated with overall physical activity. A structural equation model used correlates to explain active commuting, which in turn, was examined in relation to overall physical activity.

Methods

During April and May 2009, 518 students (22.4 years, SD 5.3) from two urban universities in Valencia (Spain) were recruited via convenience sampling and completed a 20-min self-administered paper survey during class periods.

Measures

Active commuting to university (ACU) was assessed with, “How often do you use each of the following ways to go to and from the university?” Response options were bicycle, bus, car, metro/tram/train, motorbike, walking. Participants indicated trips per week (to or from university) and usual minutes per trip in each mode of travel. A weekly estimation of energy expenditure in active commuting was obtained by multiplying a MET score of 4.0 (i.e. for cycling and walking to work/class) by the minutes per week spent walking and cycling.

Total physical activity was assessed by the Spanish version of the GPAQ survey (Global Physical Activity Questionnaire; Bull et al., 2009).
weekly estimation of total energy expenditure (MET·minutes/week) was computed.

Socio-economic status (SES) was measured using one item: “In general, how do you define your socio-economic status? ("low"= 1 to “high”= 5).

Physical self-efficacy was measured by the Spanish version of Perceived Physical Ability (PPA) subscale of the Physical Self-Efficacy scale developed by Ryckmann and colleagues (1982). The 10 items were scored on a Likert scale ranging from “strongly disagree” = 1 to “strongly agree” = 6. Example items: “I have excellent reflexes”; “I can’t run fast.” The internal consistency (Cronbach’s alpha) in the present sample was 0.80.

Barriers to walking and cycling to university. Prior to data collection, the Barriers Scale of Forman et al. (2008), specific to active commuting to school for youth, was translated into Spanish using a back-translation procedure and adapted for university students. Two focus groups of 14 and 15 students were conducted to identify barriers relevant to the university population. The final version had 14 items, using a response format from 1 (“strongly disagree”) to 4 (“strongly agree”). Interested readers may contact the corresponding author to obtain the final version.

Access to car and motorbike was assessed using 2 items: “Do you have a car for personal use?”; “Do you have a motorbike for personal use?” Items were rated 1 (“never”), 2 (“sometimes”), or 3 (“always”). Access to public transport was measured with: “How long does it take you to walk from your home to the nearest public transit? (bus, tram, metro).” Participants responded in minutes.

Walking and cycling facilities. The 5 items from the “places for walking and cycling” subscale of the Neighborhood Environment Walkability Scale (NEWS) (De Bourdeaudhuij et al., 2005) were used. An example item is: “There are sidewalks on most of the streets in my neighborhood.” Items were rated from 1 (“strongly disagree”) to 4 (“strongly agree”). Items were translated into Spanish using a back-translation procedure.

Distance to university. Participants indicated their home address, and the Spanish version of Mapquest was used to measure distance from home to university.

Statistical analyses

The reliability and validity of Forman et al.’s adapted barriers survey (2008) was tested. Test–retest reliability for each item was assessed with one-way, single measure intra-class correlations (ICC) in a sub-sample of 51 students who completed the barriers scale twice separated by a 2-week interval. To examine the factor structure, we carried out confirmatory factor analysis (CFA) with the LISREL 8.54 program. Estimated parameters were considered significant when the t-value was higher than 1.96 (p<0.05). Internal consistency was assessed using Cronbach’s alpha.

The hypothesized model (see Fig. 1) was tested with path analysis, using the maximum likelihood method of the LISREL program 8.54. Most other analyses, including descriptives and correlations, were performed using SPSS 15.0.

Results

Test–retest ICCs for the 14 barriers items ranged from 0.66 to 0.77. The structural equation model showed that the barriers scale had satisfactory fit indexes: $p<0.01$; chi-square divided by the degrees of freedom $(\chi^2/df)=2.6$; root mean square error of approximation (RMSEA) = 0.05; comparative fit index (CFI) = 0.93; nonnormative fit index (NNFI) = 0.91. The scale had adequate factor loadings, and two factors were determined: one included environment and safety related items (alpha = 0.69); another was related to planning for active commuting and psychological items (alpha = 0.72).

Table 1 presents descriptive statistics and correlations between the variables.

The hypothesized model presented good fit indexes: $p<0.01$, $\chi^2/df=2.6$, RMSEA = 0.04, CFI = 0.91, NNFI = 0.91. The parameters of the standardized solution are displayed in Fig. 1. The model explained 19% of the variance of ACU. The path from ACU to total physical activity was not significant ($p>0.05$).

Discussion

Both psychological and environmental variables were significant correlates of ACU. The strongest correlate was access to private transport (car and motorbike) which was inversely related. Physical self-efficacy, perceived planning/psychosocial barriers and walking and cycling facilities were also significant correlates of ACU. The model explained a substantial 19% of the variance of ACU, and all associations were in the expected directions.

SES was not a significant correlate of ACU, in contrast with findings from youth that higher SES was associated with less active

![Fig. 1. Model correlates--active commuting–total physical activity. Standardized path coefficients. The value of the coefficient is over the arrow "p<0.05; **p<0.01; n.s. = not statistically significant. Study conducted in 2 universities in Valencia, Spain in 2009.](image)
transportation (e.g., Babey et al., 2009). It is possible that university students are a population with limited variation in SES, or SES differences in Spain may not be as important as in the U.S. Another explanation is a general tendency for people to describe themselves as middle SES on self-reports, which would reduce variance.

The finding of physical self-efficacy as a significant correlate of ACU confirmed an Australian study of active transport to and from university (Shannon et al., 2006). ACU was significantly related to planning/psychosocial barriers, but not to environment/safety barriers. In the study of Shannon and colleagues (2006), travel time, categorized in the present study as a planning/psychological barrier, was the most important barrier for students. Travel time also has environmental elements that could be related to land use or the transportation system.

Access to car and motorbike for personal use was the strongest correlate of ACU in the present study, suggesting it may be difficult to stimulate ACU among students with access to motorized vehicles. This result is generally consistent with evidence from U.S. studies (Moczulski et al., 2007; Sisson and Tudor-locke, 2008). The use of private vehicles is associated with negative health outcomes, including unhealthy weight. In one study, students who had a drive time of more than 15 min to university were 64% more likely to be overweight or obese (Moczulski et al., 2007). A strategy for increasing ACU could be to increase the cost of car park facilities on or near the university (Shannon et al., 2006). ACU was significantly related to active commuting in the present study. Even students who lived far from university had the opportunity to commute actively by walking to public transit. Present results are not consistent with an Australian study (e.g., Shannon et al., 2006) in which distance to university was one of the most significant barriers to ACU.

Presence and quality of walking and cycling facilities were related to ACU in the present study, supporting previous findings (e.g., De Bourdeaudhuij et al., 2005). Good pedestrian and cycling facilities may make active transport safer and more convenient.

Lastly, ACU did not contribute to university students’ overall physical activity. This result is not consistent with the literature in youth (e.g., Davison et al., 2008). ACU accounted for less than 10% of total physical activity MET-min from GPAQ. Prospective studies are needed to clarify the relationship between active commuting and total physical activity in university populations.

**Study limitations**

This study has two main limitations. Firstly, as it is a cross-sectional study, conclusions about causal associations cannot be made. The second limitation is its reliance on self-report measures.

**Conclusions**

Current findings imply that a combination of psychosocial and environmental interventions may be needed to increase ACU. Promising methods suggested by current findings are improving availability and safety of sidewalks and bike lanes, educational programs to develop confidence and planning skills related to active commuting, and reducing the convenience of motorized travel, such as increasing parking fees.

**Conflict of interest statement**

The authors declare that there are no conflicts of interest.

**References**


Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Mean (SD)</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Active commuting (MET-min/wk)</td>
<td>0.0–2400</td>
<td>383.9 (354.7)</td>
<td></td>
</tr>
<tr>
<td>2. Total physical activity</td>
<td>0.0–39600</td>
<td>4391.8 (4311.6)</td>
<td></td>
</tr>
<tr>
<td>3. Socio-economic status</td>
<td>1–5</td>
<td>3.1 (0.7)</td>
<td></td>
</tr>
<tr>
<td>4. Self-Efficacy</td>
<td>1–6</td>
<td>4.2 (0.8)</td>
<td></td>
</tr>
<tr>
<td>5. Environment/safety barriers</td>
<td>1–4</td>
<td>2.7 (0.6)</td>
<td></td>
</tr>
<tr>
<td>6. Planning/psychosocial barriers</td>
<td>1–4</td>
<td>2.3 (0.7)</td>
<td></td>
</tr>
<tr>
<td>7. Access to car/motorbike</td>
<td>1–3</td>
<td>1.6 (0.5)</td>
<td></td>
</tr>
<tr>
<td>8. Access to public transport</td>
<td>0–30</td>
<td>6.5 (5.7)</td>
<td></td>
</tr>
<tr>
<td>9. Walking and cycling facilities</td>
<td>1–4</td>
<td>2.7 (0.7)</td>
<td></td>
</tr>
<tr>
<td>10. Distance (km)</td>
<td>0.2–91.3</td>
<td>12.7 (17.5)</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01.

Study conducted in 2 universities in Valencia, Spain in 2009.