

Article

Sustainable Mobility Issues of Physically Active University Students: The Case of Serres, Greece

Foteini Mikiki ^{1,*} , Andreas Oikonomou ²  and Ermioni Katartzzi ³ 

¹ School of Engineering, Serres Campus, International Hellenic University, 62124 Serres, Greece

² General Department of Pedagogical Courses, School of Pedagogical and Technological Education, 54639 Thessaloniki, Greece; aoikonomou@aspete.gr

³ Department of Physical Education and Sport Science at Serres, Aristotle University of Thessaloniki, 62110 Serres, Greece; noni@phed-sr.auth.gr

* Correspondence: fmikiki@yahoo.gr

Abstract: The mobility practices of students are largely dictated by their respective educational obligations. Students of physical education are an ostensibly physically active population, whose active lifestyle may include active travel. University student mobility research calls for behavioral approaches to ground relevant interventions. This work investigated the sustainability practices in the student community of the Physical Education Department in Serres, a medium-sized Greek city. Moreover, this paper aimed to shed light on the gender differences in the physical activity levels of 259 students, as well as their respective differences in mobility practices. A novel questionnaire, based on Ajzen's theory of planned behavior and Godin–Shephard's approach to physical activity, was used. The results confirmed higher levels of physical activity in male students, although their attitude toward physical activity was less positive than that of their female classmates. Further positive attitudes in women were recorded toward sustainable mobility choices, although the evidence demonstrated a similar gap between the answers of the two genders. Car possession was higher in men, whereas car purchase intention was slightly lower in women, who had a lower income in general. Moreover, income impacted gender mobility preferences. Recommendations can be guided by students' sports preferences and can be gender-sensitive, taking income into account.

Keywords: sustainable mobility; university students; physical activity; theory of planned behavior; Godin–Shephard's scale; gender issues



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1. Introduction

The use of non-active transport modes contributes to a sedentary and unhealthy lifestyle, as well as being detrimental to the urban environment. There is consistent, published scientific evidence that shows that higher levels of driving as a source of physical inactivity are associated with obesity [1]. Active travel could be an answer to both the human need for mobility and the necessity of completing physical activity at a moderate intensity [2]. It also has a proven positive impact on physical health and mental well-being [3].

Active forms of transport, i.e., involving physical activity (PA), include walking, cycling, and even public transport, which typically involves walking or cycling at either end of the journey. Active transport (AT) represents an opportunity to incorporate physical activity into a daily routine, offering an important range of health benefits, such as a lowered risk of obesity and cardiovascular issues [4,5]. The public health benefits of AT are wide in range, including reduced levels of traffic crashes, air pollution, and traffic-related stress, as well as lower expenses and increased human contact [6].

The promotion of sustainable mobility may thus be achieved by highlighting AT's added value for different population groups, whose respective travel choices need to be thoroughly examined in order to be targeted [7]. Young adults, students in particular, are a

well-chosen target group, as they have various transport options and a particular lifestyle, without having established adult habits. During life-phase transitions, they may develop unhealthy habits, such as poor eating and being physically inactive [8]. Tackling these tendencies through the promotion of active travel is crucial, as this transport choice might persist into adulthood and provide long-term health benefits [9].

University students' mobility has received growing attention within the travel behavior research community; students are an interesting traveler group, as they are alleged to be physically active and liable to sustainable choices [10]. It is well substantiated that universities generate large trips [10,11]; the literature provides evidence of the increasing concern around making mobility related to university campuses more sustainable and encouraging student communities to become more active travelers [12–14]. Research is also gaining ground on active commuting to universities and its association with psychosocial factors and physical activity levels in university students [15–18]. Demographic and environmental factors are being investigated as well [19–21]. Moreover, given the EU research priority of integrating gender as a paramount factor for the development of a sustainable transport system, responsive to the needs and constraints of all areas of society [22], much focus has been invested on the gender issues in mobility all over the world, including the USA, Asia, and Australia [23–26], as well as Europe [27,28]. Researchers have discussed the gender gaps in urban mobility [29], citing significant evidence supporting the claim that “how people move (where, how fast, how often) is demonstrably gendered” [30] and that gender differences in mobility are recorded in both developed and developing countries [31]. Gender determines not only the chosen mode of transport, but also the way that transport is perceived and evaluated, as studies around the world have shown [32].

In the above framework, it was judged interesting to investigate the behavioral aspects of mobility, including relevant patterns and physical activity uptake from a gendered perspective, focusing on a target population receptive to physical activity. This work aimed to enrich the research around student sustainable mobility, which may be beneficial to the overall mobility management and development of university host areas [10]. It may promise lifelong benefits; instilling life-long healthy behaviors during the university period will increase the likelihood of these positive habits being sustained throughout all life stages [6]. Following a behavioral theory-based approach, enriched by physical activity measurement techniques, this work aimed, in particular, to:

- Draw the profile of the specific physically active student group;
- Record the physical activity levels, behavioral aspects, and mobility practices of the targeted population;
- Examine the interface of physical activity uptake and sustainable mobility choices by focusing on the gender differences between physically active students;
- Extract critical aspects to be addressed in a way to turn physically active people into active travelers as well.

The remainder of the paper is structured as follows: The Background section covers the literature on university student mobility and familiarizes the reader with behavioral and gender-related approaches. The Materials and Methods section presents the data and methodology used for the study, detailing the local context. The sampling definition is presented briefly, as well as the theoretical background of the research and the instrument used. Data analysis information is provided and the results are presented in line with the aforementioned goals of the paper. The major points and limitations are discussed. Finally, the paper concludes with recommendations and implications for further research.

2. Background

2.1. Targeting the Student Community

Entering university, students are continuously challenged by choosing between all kinds of activities (including physical and sedentary ones) [33], abandoning most of them to the family context (even location) and subsequent habits. Depending on university obligations, a certain amount of self-discipline is needed to be physically active and not to

engage in convenient sedentary activities, given also the broad dissemination of sedentary culture [17]. During this decision-making process (activated attitudes and perceptions), students are influenced by the people important to them (family and friends), as well as by the availability, accessibility, and costs of these activities (physical environment). In turn, choices have to be made within a university-specific setting, e.g., living in a student residence and according to personal interest in physical activity: If they do not do any physical activity, students often replace the time they should ideally spend on physical activity with sedentary activities. Putting forward the aforementioned health benefits of active transportation within the student community should be accompanied by efforts to convince students to engage in physical activities for relaxation, less depression, and increased academic performance, as suggested by relevant studies, thereby highlighting another potential gain for university students who actively commute [11]. Effectiveness of such initiatives can be enhanced by thoroughly studying a variety of factors related to attitudes and behavior. Such attitude-based approaches can provide important information on different mobility behavior aspects [34]. They can thus contribute to the promotion of more efficient sustainable behavior [35]. Targeting students of physical education is challenging, as research shows that if physical activity is imposed by profession (or curriculum in our case), they may reduce their share in other activities such as leisure [36].

2.2. Literature and University Case Studies

The literature on the factors influencing university students' physical activity, including active transportation behavior, includes demographic (e.g., age and gender), psychological (e.g., self-efficacy and perceived enjoyment), social (social support and social norms), and physical environmental factors (e.g., living/built environment and access to facilities) [33]. However, research on the transport habits of students is scarce and is mainly focused on commuting to college or university [4], while students are often under-represented in travel surveys for methodological and attitudinal reasons [37]. Research on university students and physical activity does not inform thoroughly active travel as a daily choice for both mobility and physical activity purposes; however, researchers have reported a Chilean case study where active commuting to and from university could be a strategy to increase physical activity levels and promote health in young university students [15]. Scholars have detailed relevant works related to numerous U.S. and European university campuses [20], the latter being more urban universities, integrated into the city's urban area [27] and not in a closed geographical area, such as university campuses [24,25]. European universities are concerned with students' active mobility, and relevant works have been performed in large cities such as European capitals (e.g., Dublin) or smaller cities such as Valencia in both eastern and western Europe, from Poland to Croatia, up to Ireland and the U.K., as well as back down to Spain [16,17,38,39].

Accessibility of a university campus is vital for students' easy and safe mobility, and so is the subjective quality of travel, determining high traveler satisfaction [40]. The literature suggests that universities and surrounding communities stand to benefit when active travel mode choices are elevated: the provision of adequate walking and cycle paths around university campuses is endorsed to increase the safety for active commuting and to enhance the accessibility of on-campus PA facilities [16]. The provision of opportunities close to university housing and adequate transport infrastructure has the potential to increase both transport and recreational PA among students [41].

2.3. Equality in Mobility Research

As gender is an important factor in mobility choices, focusing on gender issues within the university community could be very enlightening when it comes to understanding adults' mobility patterns [23,42]. Equality issues are crucial for sustainability: Responding to the needs of different users and providing equal access to them should be considered, in order to achieve this target in urban mobility. As recently advocated, "The need to adopt a gender-sensitive perspective is emerging as a challenging and impending task

for urban mobility policy makers and planners. In this sense, to be effective, urban mobility policy action needs to be more gender-sensitive" [43]. Not only does gender matter in the way behavioral interventions and policy measures are designed, but it is also important in the design and planning of a more inclusive public space [44] in the philosophy of the Sustainable Development Goals established in the United Nation's 2030 Agenda for Sustainable Development [45]. Women, being more environmentally sensitive and receptive to messages for behavioral changes, offer an important chance to facilitate the achievement of these goals [43].

2.4. Behavioral Theories and Mobility Interventions

An approach responding to the above can be based on a well-established behavioral theory enriched with methodology for the targeted issue (physical activity) and a gender perspective. This approach allows for investigating attitudes and perceptions and the factors affecting the intention of being more active. The theory of planned behavior (TPB) [46] is widely used in mobility and provides a sound background for attitudinal investigation, being an understandable way of valuing the process that leads to changing a complex behavior (such as travel mode choice). Travel behavior change interventions, grounded on recognized theories such as TPB, may achieve approval, public penetration, and success [47,48], and relevant initiatives have focused on university students in the past [49].

Following the above, and given that, in relevant research work, it is advocated that students are prone to adopting good habits during their youth, it was also interesting to see whether physically active students intend to be further active as travelers. Creating mobility life habits is important, especially as after faculty years, physical uptake will not be as mandatory as it currently is, while a healthy lifestyle is linked to quality of life [17]. Moreover, adding a student environmental sensitivity perspective, to adopt sustainable travel choices would provide a good case for environmental concern, apart from the personal benefit (health) that is being taught to them within the university.

3. Materials and Methods

This work advances the behavioral approach of student mobility previously presented [10] by investigating gender differences in the framework of a case study of a specific student population. In brief, this work includes an effort to investigate student profiles as regards physical activity and active travel of a student population in Serres (northern Greece) in the Department of Physical Education and Sport Science at Serres (PHED-SR), part of the Aristotle University of Thessaloniki. The premises of PHED-SR are located on the outskirts of Serres, which is a medium-sized city, with mild terrain, public transport available, and important pedestrian and cyclist infrastructure recently put in place. Serres has good geographical and climatological conditions for walking and cycling, but currently lacks a real "cycling mentality," although it is becoming increasingly popular and merits a further gender-based study on shared biking to determine its contribution.

During the last two decades, there has been considerable urban reform in the city center; however, accessibility toward the periphery and the location of the faculty premises is penalized by a lack of continuity of pavements, as recorded in a walkability audit performed in 2015 and without interventions ever since, while there is no cycling path either [50]. The premises' host area is characterized by family dwellings and there is no option for student residences/housing.

Educational procedures involve numerous daily trips due to the scarce location of department-related destinations: faculty premises, multiple sports installations, student restaurants, etc. Meeting all tasks involves often unsustainable choices, which harm both individuals and their living environment. PHED students perform numerous daily trips: They move in order to attend mandatory theoretical lessons at the university, perform daily trips for practical physical activity exercises in numerous athletic establishments all around

the city, and visit the student restaurant, located 2 km away from PHED premises, twice a day for lunch and dinner.

The premises are served by two bus lines, one connecting Serres with the Agios Ioannis area and the other with the general hospital outside of the city boundaries. Their journeys are around 30 min for a 3.8 km distance. A student discount is available for bus tickets; however, the cost of a monthly pass is higher than for students of the International Hellenic University-IHU (Serres campus), due to a subsidy from IHU's administration. IHU's campus hosts a student restaurant, but there is no direct bus connection from PHED's premises, and this is the case for several sports destinations such as the swimming pool and football fields (Figure 1).



Figure 1. A depiction of the multiple obligatory destinations for the Department of Physical Education and Sport Science (PHED) students' daily trips (source: Own treatment of municipal GIS database files).

Given the multiple obligatory destinations for students' daily trips, access to a car is a crucial issue to investigate. Several PHED students are professional athletes entitled to work contracts that permit them to afford a car. Thus, we were interested in recording car possession and income. Moreover, for multiple reasons, several students prefer to live in Thessaloniki (80 km away from Serres) and to travel by car to Serres for faculty obligations, using it for any trip within Serres. This is often a student's family choice, as the monthly cost of using a car several times weekly is less expensive than the monthly cost of living in another city (renting an apartment, etc.)

3.1. Sampling

Among the five Greek PHED schools, three of them are located in medium-sized Greek cities with similar characteristics in terms of travel distances and available transport modes. The PHED Department of Aristotle University in Serres was selected, out of the above, as Serres is active in mobility issues, having recently elaborated one of the first Sustainable Urban Mobility Plans (SUMPs) in Greece.

The targeted population comprised current students, from first-year students to students nearing graduation. The intention was to cover the student population participating in courses of a typical educational week. From the 480 students attending the department's courses who received the questionnaire, 280 responded and 259 questionnaires were valid, constituting the final sample of the study.

The sample was tested against an acknowledged scale for physical activity uptake to discern student types according to the physical activity performed, including active travel. These questions were incorporated in a detailed questionnaire, based on the theory of planned behavior, which was applied for recording mobility attitudes and practices versus sustainable choices, as detailed below.

3.2. The Research Background and Instrument

Our research methodology involved merging the theory of planned behavior (TPB) [46] with the Godin–Shephard Leisure Time Physical Activity Questionnaire (GSLTPAQ) [51,52]. The TPB, used for investigating mobility attitudes within students, is a general social behavior theory, which provides a sound basis for environmentally relevant behavior enactment, involving three basic elements—attitude, subjective rules, and perceptual control of behavior, which together shape a person’s behavioral intentions. At the core of the TPB is the axiom that behavioral intent is the closest determinant of human social behavior.

The GSLTPAQ was used to measure PA by reporting how many times the listed activities are carried out for more than 15 min a week (7 days), during the participants’ free time. This questionnaire is simple and easy to use and does not require high self-reporting skills, and its validity and reliability are high [51,52]. The questionnaire’s score is expressed in units by summing the products of the separate components [Weekly leisure-time activity score = $(9 \times \text{strenuous}) + (5 \times \text{moderate}) + (3 \times \text{mild})$]: 24 units or more = active (substantial benefits), 14–23 units = moderately active (some benefits), and less than 14 units = insufficiently active (less substantial or low benefits) [51].

Properly adapted to the Serres context, the questionnaire was enriched with insights from physical education science and was composed of three sections. The first section involved questions about travel experience, daily physical activity uptake, and environmental protection, with five questions in total. The second section conformed with Ajzen’s TPB Questionnaire Sample [46] and used a seven-point Likert-type scale [53] (from completely disagree to completely agree), related to the four TPB constructs with questions investigating attitudes, recording the perception of subjective norms and perceived behavioral control, and finally the intention for change. It aimed to be reflective of the social ecological framework, including individual-level and environmental influences, recording all TPB concepts, attitudes, subjective norms, perceived behavioral control, and intentions.

The last section sought demographic information, as well as year of study and access to different travel modes. The participants also reported their PA uptake, based on questions from Godin’s approach, which asked about the frequency and duration of moderate and vigorous PA.

A small-scale pilot trial took place, which led to minor changes, and the final version of the questionnaire was completed in paper format by students, after theoretical or practical courses of all four faculty grades through a typical educational week. Prior to this, the aim and procedure of this research were provided to the participants in detail, and they provided their consent.

3.3. Data Analysis

According to the standards of determined reliability [54], the Cronbach’s α value must at least surpass 0.5, and ideally 0.7. Following a check of the Cronbach’s α values for each section of the questionnaire, it was judged acceptably reliable and was used in the study (it ranged from 0.707 to 0.881). Frequencies and other descriptive statistics were used to describe the sample. A Mann–Whitney test and *t*-test were used to examine gender differences. Cohen’s *d* values were also calculated [55,56]. Pearson’s correlations were used to examine the relationships between variables.

Moreover, the interaction between gender and income was examined in all subscales of the questionnaire using two-way MANCOVA analyses for each of the subscales. Analyses of variance were conducted using weekly participation in strenuous physical activity and

the total weekly leisure activity units derived by Godin's questionnaire as covariates. All analyses were conducted using SPSS 20.0.

4. Results

The investigation of mobility choices revealed simultaneous sustainable and non-sustainable choices, while elaboration of the results of the gender approach provided differences about behavioral components such as attitudes and perceived behavioral control of mobility choices. Male students were found to be more physically active but more prone to non-sustainable mobility choices such as driving. On the contrary, given the recorded sports preferred by female students, active travel could provide a valuable share of their physical activity uptake.

The main results are presented below, and further outcomes can be found within the Discussion section.

4.1. Profile, Behavior, and Practices of the Specific Physically Active Student Group

The survey addressed students in all four years of study, and 259 valid questionnaires were returned. However, several students did not answer some personal questions such as age or income. The age of the respondents was between 18 and 21 years, with some students of 22–23 years old and a minority of students older than 24. The sex ratio was 59% men and 41% women. Most of the respondents (64%) were freshmen, in their first or second year of study, which is normal, as the students near graduation had fewer class courses and did not attend lessons after which the questionnaire was distributed. Less than 10% worked on a permanent basis during their studies, as most of them have parental financial support. However, temporary jobs were recorded for 20% of the respondents. Regarding physical activity, the clear majority (>96%) took sports beyond the official curriculum of the Physical Education School, and 63% of them with a frequency of three to six times per week, with a duration of 120 min per activity for 29% of the respondents. The preferred sport type was group sports, followed by individual sports and then dual sports such as tennis.

In terms of available modes, car possession was recorded for 32.5%, bicycle for 41.1%, motorcycle for 10.4%, and intention to buy a car was considerably high (33%), with girls having a lower possession and a higher intention of purchasing a car. The general characteristics of the targeted population are shown in Table 1.

Table 1. General characteristics of the male and female PHED students ($N = 259$).

Characteristics	Categories	Male ($n = 155$)	Female ($n = 104$)
Age (year)		20.5 ± 2.5	20.2 ± 3.1
Year of study:	1st	25.2%	33.7%
	2nd	32.3%	36.5%
	3rd	14.8%	7.7%
	4th	18.7%	19.2%
Weight (kg)		78.24 ± 9.15	59.8 ± 10.8
Height (m)		1.82 ± 0.1	1.69 ± 0.1
Frequency of PA uptake (times/week)		4.56 ± 1.26	4.18 ± 1.37
Duration (min)		114.73 ± 46.9	104.18 ± 36.84
Family income:	<10,000 €	24.1%	35.4%
	10–14,999 €	21.8%	20.3%
	15,000–19,999 €	19.5%	10.1%
	20,000–30,000 €	15.8%	26.6%
	>30,000 €	18.8%	7.6%
Car possession		43%	26.5%
Intention to purchase a car		35.6%	38.4%
	Job	45.9%	49.5%

The respondents were asked to report the frequency they traveled to campus by walking, biking, and driving, resulting in a frequency score of how many trips an individual made by each mode of transportation in a scale from 5 (the most frequent) to 1 (the least frequent). The most frequent mode of transport (two to three times per week) was reported to be a bus ($M = 3.69$, $SD = 1.33$) or walking ($M = 4.22$, $SD = 1.31$) for most travel purposes, whereas the use of a car as a driver ($M = 2.21$, $SD = 1.63$), taking a taxi ($M = 2.11$, $SD = 1.01$), and cycling ($M = 2.14$, $SD = 1.35$) were the least used modes of transport, with motorbike use being the rarest ($M = 1.57$, $SD = 1.12$). Moreover, the mode of transport choice was mostly determined by the availability of the means of transport ($M = 3.35$, $SD = 1.33$), distance ($M = 3.4$, $SD = 1.33$), and travel time ($M = 3.31$, $SD = 1.22$), confirming the impact of built environmental factors, on a five-point Likert scale (1 = none to 5 = very much).

In addition, statistically significant differences were recorded by independent samples *t*-tests in some aspects that were measured between genders. As regards mobility practices, the male students reported that they used non-active modes such as a car as drivers more often ($M = 2.54$, $SD = 1.72$) compared to the female students ($M = 1.76$, $SD = 1.37$) ($p < 0.001$; $df = 236$; $t = 3.70$, $d = 0.50$), as well as motorcycle use ($M = 1.72$, $SD = 1.26$) compared to females ($M = 1.40$; $SD = 0.90$) ($p = 0.034$; $df = 236$; $t = 2.13$; $d = 0.29$), while among the factors affecting mode choices, transport system connection was considered more important for female students ($M = 3.06$, $SD = 1.31$) than for their male classmates ($M = 2.69$, $SD = 1.32$), ($p = 0.036$; $df = 242$; $t = -2.10$; $d = 0.28$). The Cohen's *d* effect sizes (ES) for each of the above variables showed that the gender comparisons corresponded to small to medium ES values [55,56].

4.2. Behavioral Analysis and Gender Issues

Gender differences in students' attitudes toward different transport modes were recorded, as well as toward environmental sensitivity and physical activity.

4.2.1. Attitudes

Students' attitudes toward different transport modes were recorded. On the one hand, car use was linked with a feeling of freedom of movement (41.7%), comfort (41.8%), and pleasure (36.8%), without cars constituting the preferred mode for practicing driving skills, drifting around, or being a life goal for students to buy their dream car. Car-related expenses were a preoccupation for more than 33.5% of car users, and car use was judged as detrimental to the environment (agree largely to fully) by 46.5%, to human health by 40.3%, and to the future generation's quality of life by 44%. Car use-related guilt was recorded, as students declared that they felt bad about their driving harming the environment (50%), quality of life, other people's health (43.1%), or their own health and physical status (55.6%).

As regards alternatives to driving a car, cycling instead of car use was deemed interesting (75.7%), useful (55%), pleasant (42.9%), and necessary (73.2%), while walking instead of driving (or being driven) daily was respectively judged as interesting (31.8%), useful (56%), pleasant (33.9%), and necessary (34.7%). The additional attitudinal elements toward alternative modes can be found in Table 2.

Table 2. Gender differences (means and standard deviations) and Cohen's *d* effect sizes in attitudes as regards travel, environment, and physical activity.

	Males	Females	t	df	p	Cohen's <i>d</i>
Environmental impact of cars	4.5 (1.9)	5.4 (1.6)	−4.10	253	<0.001	0.51
Health impact of cars	4.7 (1.5)	5.2 (1.5)	−2.52	250	0.012	0.33
Impact of cars on future quality of life regarding physical activity	4.8 (1.6)	5.3 (1.5)	−2.57	248	0.011	0.32
Taking part in environmental activities	5.0 (1.5)	5.9 (1.3)	−4.63	253	<0.001	0.64
Acknowledging the value of environmental education	5.2 (1.6)	5.8 (1.3)	−3.2	250	0.001	0.41
Being active in environmental movements	4.9 (1.4)	5.4 (1.4)	−2.85	250	0.005	0.36
Physical activity uptake of 3 times/week is interesting	5.9 (1.6)	6.4 (1.2)	−2.90	249	0.004	0.35
Physical activity uptake of three times/week is pleasant	6.1 (1.5)	6.4 (1.1)	−2.25	247	0.025	0.23
Cycling is judged as interesting compared to driving	4.7 (1.7)	5.7 (1.2)	−4.71	250	<0.001	0.68
Cycling is judged as healthy compared to driving	5.2 (1.6)	5.9 (1.2)	−3.98	244	<0.001	0.49
Cycling is judged as pleasant compared to driving	4.9 (1.6)	5.7 (1.3)	−4.03	245	<0.001	0.54
Cycling is judged as necessary compared to driving	4.5 (1.8)	5.4 (1.4)	−3.98	245	<0.001	0.55
Walking is considered as interesting compared to driving	4.5 (1.5)	5.3 (1.4)	−4.17	247	<0.001	0.55
Walking is considered as healthy compared to driving	5.2 (1.5)	5.9 (1.2)	−4.18	247	<0.001	0.51
Walking is considered as pleasant compared to driving	4.7 (1.5)	5.4 (1.5)	−3.96	244	<0.001	0.46
Guilt about the impact of cars on the environment	4.2 (1.4)	5.0 (1.5)	−4.36	250	<0.001	0.55
Guilt about the impact of cars on quality of life degradation	4.1 (1.4)	4.9 (1.5)	−4.10	245	<0.001	0.55
Guilt about the impact of cars on own health and physical condition	4.3 (1.4)	5.0 (1.5)	−3.72	244	<0.001	0.48
Guilt about the impact of car son public health	4.4 (1.6)	4.8 (1.7)	−2.08	245	0.039	0.24
Cycling paths are important for a city's network	5.6 (1.4)	6.0 (1.4)	−2.26	248	0.025	0.28
Cycling permits social contact	4.6 (1.6)	5.0 (1.4)	−2.74	249	0.007	0.26
Cycling is value for money	5.4 (1.5)	5.8 (1.4)	−2.03	243	0.043	0.27
Cycling suits my personality	3.5 (1.9)	3.0 (2.0)	2.11	242	0.036	0.25
Walking suits my personality	3.6 (1.8)	2.5 (1.8)	4.21	243	<0.001	0.61
Bus permits social contact	4.3 (1.4)	4.7 (1.5)	−2.04	246	0.042	0.27
Bus suits my personality	3.6 (1.6)	3.1 (1.7)	2.50	238	0.013	0.30

Alternative transport modes were considered less stressful than car use by 43.2% of the respondents, while in terms of relevant infrastructure, cycling paths were considered essential for a city network according to 76.4% of the sample, and 55.4% believed that the benefits of pedestrianization outweighed the difficulties it might have created.

Moreover, the attitudes toward environmental protection were captured, as 59.3% considered it necessary to take action for the environment, while relevant education was judged to be required by 60%. The necessity to be a member of an environmental organization was also highlighted by 43%. Lastly, attitude toward physical activity, as expected for the specific target group, was positive, as physical activity uptake was judged as interesting (75.7%), useful (81.8%), pleasant (77.5%), and necessary (73.2%).

Independent samples *t*-test analyses regarding gender differences for attitudes about travel, the environment, and physical activity showed statistically significant differences in all examined attitude variables ($p < 0.05$). Cohen's *d* effect sizes (ES) for each one of the attitude variables and gender comparisons are presented in Table 2. A *d* value of 0.01 denotes a very small ES, a value of 0.20 a small ES, a value of 0.50 a medium ES, a value of 0.80 a large ES, a value of 1.20 a very large ES, and a value of 2.0 a high ES [55,56].

All attitude variables corresponded to a small to medium ES value (Table 2). Female university students were found to be more sensitive to the negative impact of using a car for transportation on the environment, health, and the next generation's quality of life, to participating in actions and organizations in favor of the environment, to being physically active, to riding a bike or walking instead of driving, to the importance of cycling paths for a city's network, and to the importance of public transport and cycling for social contact than males. In addition, female students considered cycling, walking, and taking a bus to suit their personality more compared to males (Table 2).

4.2.2. Subjective Norms

A subjective norm is a perceived social pressure to engage or not in a behavior. It is assumed that subjective norms are determined by the total set of accessible normative beliefs concerning the expectations of important referents. Students answered whether it was important for them that people would welcome their undertaking more environmental action (68.3%) and more regular physical activity (64.3%). In addition, the impact of others' opinions on alternative modes and less car use were recorded, encouraging walking (57.1%), cycling (48.6%), and taking the bus (45%) rather than car use, while only 36.5% declared that people important to them would encourage more daily car use.

4.2.3. Perceived Behavioral Control

According to the theory of planned behavior, the enactment of everyday environmentally relevant behavior is under conscious control; thus, regarding self-efficacy in terms of mobilization for the environment, 58.2% declared it easy for them and 63.9% intended to take such action. Participants reported their self-efficacy by indicating their level of confidence to undertake physical activity, increasing the number of times they walked or cycled on a scale from 1 (not at all confident) to 7 (very confident). Getting regular physical exercise was found to be easy for 79.4% and was intended by 80.4%. Shifting from car use to walking, cycling, or bus use was declared easy for 58.2%, 45.3%, and 50.3%, respectively. Similar answers were received as regards the declared general intention to shift from car use to walking (56.8%), cycling (45.4%), and taking the bus (45.7%).

4.2.4. Intentions

Behavioral intentions are an indication of an individual's readiness to perform a given behavior and are assumed to be an immediate antecedent of behavior [46]. These intentions are based on attitudes toward behavior, subjective norms, and perceived behavioral control; however, in this study, the impact of the respective predictors was not weighted for their importance in relation to the behavior and target population.

Individuals were also asked to declare agreement regarding their intention to engage in sustainable practices on a seven-point Likert scale ranging from 1 (totally disagree) to 7 (totally agree). When it comes to the short-term change in practice regarding being more active next week for environmental protection, intention was a bit lower (51.1%). Intention to engage in regular physical activity in the following weeks was found to be high in general (51.1%), as was the recorded intention in the forthcoming weeks to shift from car use to walking (59%), cycling (41.4%), and taking the bus (45.4%).

4.3. Comparison of Physical Activity Levels between Genders and Relation with Theory of Planned Behavior (TPB) Constructs

According to the measurement of physical activity, all students demonstrated high scores, as expected, with slight differences in strenuous physical activity. The physical activity analysis is presented in Table 3.

Table 3. Participants' physical activity descriptives: Godin's scores for gender and *t*-tests.

	Mean $\pm$ SD	Range	Male	Female	<i>t</i>	df	<i>p</i>
Strenuous PA (<i>N</i> = 229)	4.0 $\pm$ 1.6	0–7	4.2 $\pm$ 1.5	3.6 $\pm$ 1.6	2.8	224	0.005
Moderate PA (<i>N</i> = 203)	2.8 $\pm$ 1.8	0–7	2.6 $\pm$ 2.0	3.1 $\pm$ 1.5	−1.5	196	0.128
Mild PA (<i>N</i> = 197)	2.5 $\pm$ 2.2	0–7	2.3 $\pm$ 2.3	2.8 $\pm$ 2.1	−1.4	190	0.157
Weekly PA units (<i>N</i> = 190)	57.1 $\pm$ 22.0	0–119	58.2 $\pm$ 23.1	55.4 $\pm$ 19.8	0.9	185	0.387

Correlation analysis was performed to find relationships between Godin's recorded PA and the different TPB-related questions/constructs. Pearson's bivariate correlation analysis showed significant correlations between Godin's PA and the TPB variables. More specifically, low levels of PA had a positive significant correlation with attitude toward walking ($r = 0.196$, $p < 0.001$), which indicates that students with low PA include walking to their low-intensity PA uptake. This is coupled with the finding of the positive correlation between low PA and perceived behavioral control of walking ($r = 0.151$, $p < 0.05$). Moreover, regarding cycling, the more highly physically active students were, the less dangerous they consider it to be ($r = -0.145$, $p < 0.05$). Another interesting finding was that highly physically active students were less socially influenced in terms of environmental protection ($r = -0.165$, $p < 0.05$) and seemed to feel less guilty about the impact of their driving ($r = -0.147$, $p < 0.05$).

Comparisons regarding the physical activity level profile between male and female students revealed statistically significant differences only in the frequency of high-intensity physical activity ($t_{224} = 2.813$, $p = 0.005$) according to Godin's scale, with the male students being more physically active than the female students. However, both genders were highly physically active [51]. Moreover, independent samples *t*-test analyses regarding gender differences in the items of the TPB-based questionnaire (seven-point Likert scale ranging from 1 = totally disagree to 7 = totally agree) showed statistically significant differences ($p < 0.05$) in all variables related to attitudes (Table 2). Cohen's *d* effect sizes (ES) for each of the TPB construct subscales and gender comparisons are presented in Table 4. All TPB variables corresponded to a small to medium ES value (Table 2). Once again, female university students were found to be more sensitive to harming the environment by driving for transportation, to participating in actions in favor of the environment, and to being physically active and using a bicycle or walking than males. Although there was a statistical difference in attitudes about being physically active, given the small effect size of this difference, male students were also found to be positive about participating in physical activity, but less so than females. In addition, considering the personal perceptions of intended activity in favor of the environment, for being physically active according to the general guidelines for health benefits, for walking, cycling, or taking the bus instead of using a car, female students had greater intentions to behave in such ways compared to males (Table 4).

Table 4. Gender comparisons (means and standard deviations) and Cohen's *d* effect sizes of the Theory of Planned Behavior (TPB) construct subscales, attitudes and perceived behavioral control (PBC).

Variable	Mean(SD)		<i>t</i>	df	<i>p</i>	Cohen's <i>d</i>
	Males	Females				
Attitude toward the impact of cars	4.7 (1.5)	5.3 (1.4)	−3.38	248	<0.001	0.41
Attitude toward environmental protection	5.1 (1.3)	5.7 (1.2)	−3.92	249	<0.001	0.47
Attitude toward physical activity	6.1 (1.4)	6.4 (1.1)	−2.125	244	0.035	0.23
Attitude toward cycling	4.8 (1.5)	5.6 (1.1)	−4.759	243	<0.001	0.60
Attitude toward walking	4.8 (1.2)	5.5 (1.2)	−4.096	243	<0.001	0.58
Feelings of guilt	4.2 (1.3)	4.9 (1.4)	−3.967	244	<0.001	0.51
PBC for environmental protection	4.7 (1.3)	5.3 (1.2)	−3.747	238	<0.001	0.47
PBC for physical activity	5.9 (1.3)	6.2 (1.2)	−1.96	238	0.051	0.23
PBC for more walking	4.5 (1.7)	5.2 (1.5)	−3.453	40	<0.001	0.43
PBC for more cycling	4.1 (1.6)	4.7 (1.6)	−2.677	240	<0.001	0.37
PBC for more bus use	4.0 (1.6)	4.5 (1.6)	−2.344	244	<0.001	0.31

Moreover, a two-way MANCOVA was employed to examine the interaction of gender and income in relation to the outcome variables of the behavioral constructs (attitudes, subjective norms, perceived behavioral control, and intentions), controlling for weekly participation in strenuous physical activity and the total weekly leisure activity units derived by Godin's questionnaire. A gender by income multivariate interaction did not emerge in any examined variable ($p < 0.05$). However, significant univariate effects were found in one item of the attitude construct (attitude toward walking) and whether they find it pleasant ($F(4, 152) = 4.02$, $p = 0.004$, partial eta squared = 0.102). This denotes that female students with low income had higher scores, finding it pleasant to walk as an everyday transportation mode compared to their male classmates, while high-income females scored lower than males. Moreover, significant univariate effects were found for one item of the intention construct, namely, intention to participate in physical activity ($F(4, 149) = 3.30$, $p = 0.013$, partial eta squared = 0.087), denoting that female students with low income had higher scores and intended to participate in exercise programs more regularly than their male classmates, and once again, high-income females scored lower than males.

5. Discussion

In forming a profile of the target population, the results revealed environmental awareness and protection of students, which is a promising statement, as individuals with more ecologically friendly attitudes were significantly more likely to actively commute and perceived more motivators and fewer barriers for AT compared to those with less ecologically friendly attitudes [6].

Additionally, our results confirm the hypothesis of the target group being a really physically active one and largely confirms the literature, as a combination of factors influences the choice of transport mode of students, as multiple components of the TPB suggest.

According to the sample answers, bicycle possession was high and cycling was a good transport option, its flexibility and autonomy being major advantages, allowing it to meet the wide scope of activities of 18- to 25-year-olds [57]. Another advantage of cycling is the low cost compared to the costs of other modes broadly criticized, such as the bus. "The potential to save money" could be one of the most effective motivating factors for students to use active modes of transport, as they are very susceptible to monetary costs [11]. Barriers to cycling as a transport mode recorded in previous studies [58], such as comfort, practicality, a lack of connected cycle routes and infrastructure, and a lack of certain facilities such as bicycle parking, were mentioned on the initiative of certain respondents, as there were no specific questions for recording barriers. Females had a more positive attitude toward cycling and a higher concern when using a car; however, they declared it less suitable for them than males. Attitudes and practices may change,

as students can now have a different cycling experience in the city by using a recently introduced bicycle sharing system.

Walking as a transport mode has advantages in line with those of cycling, such as flexibility and low costs. However, only a few participants in the present study used this transport mode, as it is only practical for very short distances and students want their travel time to be as short as possible [15]. Public transport trips often involve walking and may thus contribute significantly to the volume of daily physical activity [59]; however, this benefit is not really acknowledged by young people [60]. Although the students were found to be environmentally sensitive, more so female students, thus confirming the literature, they also stated that they enjoy driving and intend to purchase a car, again in agreement with the literature [61] in that young people's values are more strongly related to self-image, identity, and materialism than to protecting the environment, as well as in socioeconomic status being crucial for active commuting choices [20]. The results further confirm a gender and income interaction, as well as an impact on attitudes toward walking, with higher-income students finding it less appealing.

The current results also confirm the social benefits of active travel, such as human contact [6]. Limitations such as traveling longer distances [15] might be partially solvable through multimodality [62], which seems to be a convenient way to encourage and increase sustainable and active transport modes in the future. Bicycle sharing schemes might, therefore, be promising, as they allow people to easily combine cycling and public transport.

Unfortunately, the public transport system in Serres has several weaknesses that are barriers for students. The lack of flexibility (long waiting times, delays, and limited night and weekend services) was an important barrier for students, as well as the high cost. Confirming [33], the research showed that university students are very susceptible to monetary costs. In fact, there was a recent change in the location of the student restaurant and most of the students appeared not to approve of its current place, being farther from PHED's premises than the previous one, which was located in the city center and allowed them to combine other activities. In addition, there is no direct connection from PHED's premises to the IHU campus (restaurant location), which results in quite a time-consuming process involving using the bus for restaurant visits, with the distance making walking less appealing. Furthermore, the PHED students accused the local bus operator of discrimination in the fare policy between students of PHED and students of IHU, which is, however, justified by the ticket subsidy from IHU's administration. Suggested strategies to increase the use of public transport to commute include increased service frequency, implementing a cheap student pass, and providing clear and readily available timetabling information [11]. Exploring in more detail how the public transport system can be improved to meet students' needs will indirectly increase AT as well, in line with [15].

Previous research on students has claimed that social support of a friend or colleague is considered a facilitator of cycling [58]. By contrast, social influence could also have a negative effect on the choice of AT, pushing students toward motorized transport (driving together). In fact, university years are usually the time of one's first driving experience and obtaining a driving license is a milestone for young people. Future research should take this two-sided effect of social influence into account. Our results advocate that important others are said to be in favor of alternative modes; however, the students admitted that their precious ones would also encourage only important use of their car. Thus, there is a feeling of social desirability in their social influence records.

Access to a car for personal use was a strong barrier to AT in this study, as per previous research [5,63]. The results demonstrated gender differences in car possession in favor of male students, with similar intentions to purchase a car, which could be linked to the lower income of female students. What needs to be studied with cautiousness is the fact that PHED student destinations for faculty activities are very scarce and do not face parking availability problems; this, it is easily assumed that once a car is available, taking the bus is no longer an option. By contrast, although the students raised cost issues, in the case of car use, they seemed to ignore, or at least to neglect, the overall cost of severe car use

(purchase, insurance, taxes, maintenance, fuel consumption, etc.) and perceived the direct cost of a bus ticket as high and as an important daily burden [20].

Regarding physical environmental factors, travel time seemed to be the most important factor, especially given the statement that it is not feasible to follow when consecutive courses are being held in different faculty locations. Distance appears to be an important influence on commuting patterns, especially for students who usually live within close proximity of their university [6], which was not the case for the PHED students of Serres. Although distance may be a significant deterrent to AT, improving the built environment for walking and cycling may help to overcome some of these limitations and may lead to more active commuting, as also advocated by [15].

6. Conclusions

Both the public health and transportation sectors recognize the overlapping agendas of promoting physical activity and active transport as a means of achieving sector-specific goals [64]. This study adds to the literature investigating the determinants of sustainable mobility practices in university students, involving physical activity to a large extent, given the chosen target group—physical education students. Being already physically active, this group engages in more physical activity on their own initiative either by habit, for health and physical status, or the high esteem of self-benefits from exercise. This research sheds light on whether active transport could meet the needs for more physical activity beyond academic obligations and whether gender differences are present, as the literature suggests for other faculty students [21].

Recommendations for reducing the barriers to active transportation such as travel time include introducing a bus line during lunch time and linking PHED faculty premises with the student restaurant. Furthermore, expanding the bike-sharing system by allocating new stations in locations of interest for PHED students, such as the sport activities areas, the restaurant, and the faculty premises, would ease the students' lunch and training trips and would boost biking promotion within the overall community. This should be accompanied by tailored and thus promising interventions aiming to improve university students' active transportation. Asking students which strategies may be more effective for this goal should follow, as interventions based on students' ideas may be more feasible on a university campus [33].

College campuses impact the well-being and behavioral habits of both their students and staff, and evidence on the liaison of physical activity and life satisfaction should not be neglected [17]. With their large community (students and staff), universities can be influential institutions for public health [5]. Future quantitative studies should keep in mind the importance of cycling and its characteristics and should explore further multimodality, promising to increase active and sustainable transport. Of course, the extent to which "car culture" is ingrained into the mindset of modern society could pose challenges to this goal. Gender-based analysis informs on the appeal to female students of obtaining a car, so they should be targeted with the rationale of the impact of car use on their health [20] and on the broad environment. Community-wide interventions targeting individual-level travel attitudes, beliefs, and behaviors (e.g., personalized travel feedback programs and marketing campaigns [65] combined with changes in policy that result in more supportive pedestrian and cycling environments [20] at the regional and local scales) may be necessary to obtain significant and long-term changes in active travel behavior.

The "carrot and stick" approach of motivation (strategy) is needed, encouraging people to consider issues other than travel time, such as travel cost. Car sharing promotion could be an answer, meeting not just the wish to drive, but to act in a more sustainable way. Students would welcome a subsidized public transport pass, an effective measure according to previous research [66]. Effective strategies also include increased service frequency to campus, increasing the number of cycle and pedestrian routes, which confirms the points made by reference [16], providing clear and readily available timetabling information, and increasing the amount of student housing near campus.

As green consciousness was recorded, active transport could also be promoted as an eco-friendly option. Female students proved to be more environmentally sensitive, confirming the literature, and the findings are in line with those of other scholars, suggesting that targeting women [21] and offering ample opportunities for developing environmentally focused interventions could increase active travel.

To conclude, in contrast to previous works dealing with students in general, this work, focusing on physically active students, did not aim to extensively measure behavioral constructs, but to use an acknowledged theoretical background and a tested tool for sustainable travel research on a case study. We applied a tool that had undergone validity tests, but its former application was within an experimental design with a small group [53], having expressed their consent to participate, whereas in this work, a larger population (students of a specific discipline only) were asked unexpectedly, after a course, to respond to this survey. It should be considered that students would appreciate a shorter questionnaire, with open questions to allow expansion on the perceived barriers they face, with an added comments section on the questionnaire sheets, which were taken into consideration. This creates implications for further research that includes qualitative research methods as well.

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