MANUEL HERRADOR COLMENERO

ACTIVE COMMUTING IN WOMEN WITH FIBROMYALGIA AND IN HEALTHY YOUNG PEOPLE

INTERNATIONAL DOCTORAL THESIS 2017

BIOMEDICINE DOCTORAL PROGRAM

UNIVERSITY OF GRANADA
FACULTY OF SPORT SCIENCES

DEPARTMENT OF PHYSICAL EDUCATION AND SPORT

Editor: Universidad de Granada. Tesis Doctorales
Autor: Manuel Herrador Colmenero
ISBN: 978-84-9163-533-8
URI: http://hdl.handle.net/10481/48344

Cover and back cover designed by Manuel Herrador-Colmenero
Cover picture, source: Manuel Herrador-Colmenero

Tesis Doctoral Internacional / International Doctoral Thesis

PROGRAMA OFICIAL DE DOCTORADO EN BIOMEDICINA

DEPARTAMENTO DE EDUCACIÓN FÍSICA Y DEPORTIVA
FACULTAD DE CIENCIAS DEL DEPORTE
UNIVERSIDAD DE GRANADA

ACTIVE COMMUTING IN WOMEN WITH FIBROMYALGIA AND IN HEALTHY YOUNG PEOPLE

DESPLAZAMIENTO ACTIVO EN MUJERES CON FIBROMIALGIA Y EN JÓVENES SANOS

MANUEL HERRADOR COLMENERO

2017

Para ti Manuel, que naciste junto a esta Tesis.

Dedicada también a mi mujer, Inma, y a mis padres y hermana.
Esto es fruto de todo vuestro apoyo y confianza en mí.

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al firmar esta Tesis Doctoral, que el trabajo ha sido realizado por el doctorando bajo la dirección y tutela de los Directores de la Tesis y hasta donde nuestro conocimiento alcanza en la realización del mismo. Y que, además, se han respetado los derechos de otros autores a ser citados cuando se han utilizado sus resultados o publicaciones.

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The doctoral candidate
D. Manuel Herrador Colmenero
and the Thesis supervisors
Dña. Palma Chillón Garzón y D. Jonatan Ruiz Ruiz

Guarantee,

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El doctorando D. **Manuel Herrador Colmenero** ha realizado la presente Tesis Doctoral Internacional como beneficiario de una beca-contrato con cargo al programa de Formación de Profesorado Universitario (FPU) del Ministerio de Educación, Cultura y Deporte (código: FPU13/01088), por Resolución de 22 de agosto de 2014, de la Secretaría de Estado de Educación, Formación Profesional y Universidades, por la que se conceden ayudas para contratos predoctorales para la Formación de Profesorado Universitario, de los subprogramas de Formación y Movilidad dentro del Programa Estatal de Promoción del Talento y su Empleabilidad (BOE-A-2014-9081, publicado el 4 de septiembre de 2014).

Marcher en ligne droite, on ne peut pas aller très loin
"Caminando en línea recta, no puede uno llegar muy lejos"
(Le Petit Prince- Antoine de Saint-Exupéry)

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Research projects

The present Doctoral Thesis was performed as a result of the following research projects:

1. The al-Ándalus Project: Physical activity in women with fibromyalgia: effects on pain, health and quality of life. DEP2010-15639. Principal investigator: Manuel Delgado Fernández. Date: 01/07/2010 to 30/09/2014.). Funding: 118,580€ [This Project led to Studies I to IV of the present Doctoral Thesis]
2. The UP&DOWN Study: Follow-up in healthy schoolchildren and in adolescents with down syndrome: psycho environmental and genetic determinants of physical activity and its impact on fitness, cardiovascular diseases, inflammatory biomarkers and mental health (up&down). DEP 2010-21662-C04-00. Principal Investigator: Ascensión Marcos. Date: 01/01/2011 to 31/12/2014. Funding: 453,000 € [This Project led to Study VI of the present Doctoral Thesis].
3. The PACO project "Pedalea y Anda al COlegio": retrospective analysis of commuting to school in Spain and implemention of interventions to promote active commuting among young people. DEP2016-75598-R. Principal investigator: Palma Chillón Garzón. Date: 01/01/2017 to 31/12/2020. Funding: 70,000 €
4. Additionally, from the collaboration between the Granada Deputation (Environment Area) and the University of Granada in the mobility to school project "Safe routes design" (Diseño de itinerarios seguros), led to Study IX of the present Doctoral Thesis. This project was conducted by Mrs Myriam Pietro Labra (Granada Deputation) and managed by Mr David Fernandez Caldera, Mrs Maria Teresa Madrona Moreno and Mr Rubén Rodríguez Ramírez. From the University of Granada, the principal investigator Palma Chillón Garzón and a group of researcher collaborated in this project. This project was funded by the Granada Deputation, European funds (FEDER) and the frame of the "Red Granadina de Municipios hacia la Sostenibilidad" (GRAMAS).

Additional funding was obtained from:

A. Consejería de Turismo, Comercio y Deporte, Junta de Andalucía, Spain (CTCD-201000019242-TRA).

B. Granada Research of Excelence Initiative on Biohealth (GREIB), Campus BioTic, University of Granada, Spain.

C. European University of Madrid, Escuela de estudios Universitarios Real Madrid, Spain (2010/ 04RM).

D. Spanish Ministry of Education (FPU13/01088), grand PhD.

E. Other grants associated with the al-Ándalus project are: AP-2010-0963, FPU12/00963, FPU15/00002, BES-2011-047133, BES-2014-067612, RYC-2010-05957, RYC-2011-09011.

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Abbreviations

ACR, American College of Rheumatology

ALPHA, Assessing Levels of Physical Activity and fitness

ANCOVA, One Way Analysis of Covariance

ANOVA, One Way Analysis of Variance

BDI-II, Beck Depression Inventory-second edition

BMI, Body Mass Index

CI, Confidence Interval

CPSS, Chronic Pain Self-Efficacy Scale

FIQR, Revised Fibromyalgia Impact Questionnaire

HRQoL, Health Related Quality of Life

ICC, Intra-class Correlation Coefficient

IPAQ, International Physical Activity Questionnaire

MCMC, Markov Chain Monte Carlo

MFI-S, Spanish version of the Multidimensional Fatigue Inventory

MMSE, Mini-Mental State Examination

MVPA, Moderate-to-Vigorous Physical Activity

OR, Odds Ratio

PA, Physical Activity

PCS, Pain Catastrophizing Scale

PSQI, Pittsburgh Sleep Quality Index

SD, Standard Deviation

SF-36, 36-item Short-Form Health Survey

SIQR, Symptom Impact Questionnaire

WHO, World Health Organization

Resumen

El sedentarismo y la inactividad física están creciendo en la población mundial. Comportamientos como el desplazamiento activo (p.e. desplazarse a destinos comunes locales a través de medios activos como andar o en bicicleta) aparecen como una fuente para incrementar los niveles de actividad física. Este comportamiento es fácilmente incorporable a las rutinas diarias y presenta más beneficios además del incremento de actividad física (p.e. sociales y ambientales). Por lo tanto, los objetivos de esta Tesis Doctoral son desarrollar instrumentos para evaluar este comportamiento y comprender cuáles características son más favorables para desplazarse activamente en mujeres con fibromialgia y jóvenes.

El Proyecto I está centrado en mujeres con fibromialgia, analizando la fiabilidad y validez de un instrumento para evaluar el ambiente percibido y las rutinas de desplazamiento (Estudio I); y comprender las características de estas mujeres en relación a factores socioeconómicos (Estudio II), actividad física general (Estudio III) y sintomatología (Estudio IV). El Proyecto II está centrado en jóvenes, proponiendo un cuestionario a través de una revisión sistemática (Estudio V) y analizando la validez y propiedades psicométricas del cuestionario (Estudios VI y VIII). Además, se analizaron las asociaciones de las condiciones climáticas, acompañamiento y percepción de seguridad en relación con el desplazamiento activo al colegio (Estudios VIII y IX).

Los principales resultados de esta Tesis Doctoral fueron: I) El cuestionario de percepción del entorno y el cuestionario de modo de desplazamiento son instrumentos fiables y válidos; II) Mujeres con fibromialgia y sanas tienen patrones similares de desplazamiento activo cuando son jóvenes. Las demandas familiares están inversamente asociadas con los patrones de desplazamiento activo en mujeres con fibromialgia; III) Las mujeres con fibromialgia que se desplazan activamente realizan menos tiempo sedentario y se involucran en más comportamientos físicamente activos que aquellas que se desplazan pasivamente; IV) Mujeres jóvenes con fibromialgia que se desplazan activamente presentan mejor sintomatología en relación al impacto de la fibromialgia, salud relacionada con la calidad de vida y fatiga, que mujeres con fibromialgia mayores y/o pasivas; V) Las medidas auto-reportadas sobre el desplazamiento hacia y desde el colegio fueron heterogéneas y solo unos pocos estudios presentaron preguntas fiables y válidas; VI) El cuestionario de modo y frecuencia de desplazamiento hacia y desde el colegio muestra una validez convergente como herramienta para evaluar este comportamiento en niños y adolescentes españoles; VII) Para evaluar el modo de desplazamiento se recomienda incluir ambas direcciones del trayecto (p.e. hacia y desde el colegio) y solo utilizar el modo usual; VIII) Condiciones climáticas específicas muestran asociaciones positivas con el desplazamiento activo a la escuela diario. Además, algunas desviaciones del modo usual fueron asociadas con las condiciones climáticas; IX) Entre niños que se desplazan activamente al colegio, aquellos que eran mayores indicaron un mayor porcentaje de desplazamiento independiente al colegio que los menores y los desplazamientos independientes al colegio fueron asociados con la percepción de seguridad.

Los resultados de esta Tesis Doctoral proporcionan herramientas para evaluar y mejorar comprensión del desplazamiento activo en mujeres con fibromialgia –atendiendo a factores socioeconómicos, actividad física y sintomatología- y en los jóvenes -atendiendo a la influencia de las condiciones climáticas, acompañamiento y percepción de seguridad-. Estos resultados nos conducirán a futuras investigaciones en las que los programas de intervención para fomentar el desplazamiento activo puedan ser más precisas.

Abstract

Sedentariness and physical inactivity is growing around the world population. Active commuting behaviours (i.e. traveling to local common destinations by active means such as walking or cycling) appear as a source to increase physical activity (PA) levels. This behaviour is easily incorporable to daily routines and present more benefits apart from the PA increase (e.g. social or environmental benefits). Therefore, the aims of this Doctoral Thesis are to develop instruments to assess this behaviour and to understand which characteristics are more favourable to commute actively in women with fibromyalgia and young people.

Project I is focused on fibromyalgia women, analysing the reliability and validity of an instrument to assess the perceived environment and the commuting behaviours (Study I); and understanding the characteristics of women with fibromyalgia regarding socioeconomic factors (Study II), general PA (Study III) and symptomatology (Study IV). Project II is focused on young people, proposing a questionnaire throughout a systematic review (Study V) and analysing the validity and psychometric properties of the questionnaire (Studies VI and VII). Moreover, the associations of weather conditions, accompaniment and safety perception with active commuting to school are analysed (Studies VIII and IX).

The main findings of this Doctoral Thesis were: I) The environmental and the mode of commuting questionnaires are a reliable and valid tools; II) Fibromyalgia and healthy women have similar patterns of active commuting when they are young. Family demands are inversely associated with commuting patterns in women with fibromyalgia; III) Women with fibromyalgia who commute by active means spend less sedentary time and are involved in greater physical activity behaviours than those who commute passively; IV) Young women with fibromyalgia who commute actively presents better symptomatology for fibromyalgia impact, Health Related Quality of Life and fatigue, than older and/or passive commuter counterpart; V) The reporting of self-report measures for commuting to and from school was heterogeneous and only a few studies presented a reliable and valid question; VI) The Mode and Frequency of Commuting to and from School Questionnaire shows a convergent validity as tool to assess this behaviour in Spanish children and adolescents; VII) To assess the mode of commuting is recommended to include both trip directions (i.e., to and from school) and only the usual mode; VIII) Specific weather conditions had positive association with the daily active commuting to school. Additionally, some deviations from the usual mode were associated with weather conditions; IX) Among children who commute actively to school, those who were older reported a higher percentage of independent commuting to school than younger counterparts and independent commuting to school was associated with safety perception.

The results of this Doctoral Thesis provide tools to assess and to enhance our understanding about active commuting behaviours in fibromyalgia women (regarding socioeconomic factors, physical activity and symptomatology) and in young people (regarding to the influence of weather, accompaniment and safety perception). These results will lead us to future research in which intervention strategies to encourage active commuting could be more accurate.

INTRODUCTION

Disturbed
Immortalized (2015)
The sound of silence

INTRODUCTION

1. Active commuting.

Commuting is defined as a travel between home and study, work or local places on a regular basis. When the route of this travel is covered by active means such as walking or cycling, is called active commuting; meanwhile it is called passive commuting when motorized modes of transport (e.g. car, motorcycle, bus, metro, train, etc.) are used.

Active commuting is a behaviour easily incorporable in daily routines with several benefits. Apart from the environment and social benefits (such as reduction of carbon dioxide emissions and traffic congestions among others)[1,2], active commuting has been associated with health benefits. A recent systematic review about the effects of active commuting on health benefits, concluded that this behaviour reports health benefits independently of the geographical context[3].

In adults and older adults, active commuting has been associated with lower body mass index (BMI), smaller waist circumference, lower high waist-hip ratio, lower skinfold thickness and lower systolic blood pressure[4–8]. Specifically, when cycling is used to active commuting, all the general benefits presented for active commuting are increased[7], and also it has been observed better cardiorespiratory fitness[7,8], reductions of sickness absence and improving or maintaining wellbeing[9] and was inversely associated with all-cause mortality[10,11]. Among young people, choosing active modes of commuting has health benefits such as healthier body composition[12], better cardiorespiratory fitness -especially when cycling-[12–14]. This behavior is positively associated with academic skills in both boys and girls[15].

Picture 1. Family commuting actively. (Source: Manuel Herrador-Colmenero)

1.1. Active commuting and physical activity.

The World Health Organization (WHO) describes the different domains in which physical activity (PA) might occur, including work, transport, domestic duties and leisure time activities[16]. Regarding transportation, active commuting provides daily opportunities to be physically active and this behaviour might be one of the sources for increasing the PA in the general population [17,18]. Previous studies have found that active commuting increase PA among adulthood (especially in women)[7,17,18] and young people[13,19].

Active commuting behaviour ensure a daily energy expenditure. In fact, a study carried out in sedentary adults (<150 min/week of moderate-to-vigorous physical activity (MVPA)) showed that walking and cycling result in an energy expenditure of 6.5 and 8.2 METs[20]. Even when electric assisted bikes were used for cycling, the results obtained with higher assistance are similar to the obtained for walking (6.1 METs); and the results obtained with moderate assistance are lower to the obtained for cycling in a regular bike (7.3 METs)[20]. These increases in energy expenditure, compared with passive modes of transport, means an increase in PA, which might lead the achievement of the recommendations of PA (≥150 min/week of MVPA). For example, in a study conducted in India and Bangladesh, a 46% of adults (mean age 39.9 years, 42.6% males) achieved the PA recommendations using solely active modes of commuting[5]. Further, in the developing countries, car ownership has been associated

with lower MVPA, and in countries such as United States, the car is the main mode of commuting[21]. Therefore, increases on active commuting were associated with positives changes in PA in adults, being the promotion of active commuting a potential public health strategy to increase PA[22], and its consequent benefits.

On the other hand, to promote active and healthy lifestyles for young people is required, due to the high level of sedentary behaviours and the low level of fitness[23]. For example, around 80% of adolescents aged 13-15 years old fail to meet the international PA guidelines[24]. In this scene, active commuting appears like an opportunity to increase PA levels. During school hours, active commuting to school is the most important predictor of PA energy expenditure increases[25]. Regarding the 60 min/day of MVPA recommend by the WHO for young people[16], active commuting might help to achieve this recommendation. A previous study associated walking to school with an increase of 24 min/day of MVPA[26], meaning that young people who go to and come back from school walking achieve 48 min/day of MVPA (24 min of MVPA for each trip); which represent 80% of the daily recommendation (i.e. 60 min/day).

1.2. Assessment of active commuting.

To assess this healthy behaviour, there are different methods, and questionnaires are the most common.

Studies in adults usually assess the behaviour asking mainly about the usual mode of commuting to work and/or the time per week of active commuting to work[17,22,27–32], and less studies ask for other different destinations (e.g. shopping or personal business, visit personal friends, other social activities, etc.)[31,32]. Additionally, some studies use other kinds of questionnaires such as the International Physical Activity Questionnaire[33–35], Global Physical Activity Questionnaire[36], Neighbourhood Physical Activity Questionnaire[37], Recent Physical Activity Questionnaire[22] or Sedentary, Transportation and Activity Questionnaire[38] to assess active commuting behaviour throughout adults. Yet, these questionnaires are focused on general PA while the active commuting is one of the components of the questionnaire.

In young people, some studies have looked into how to assess modes of commuting to school (school is the destination most commonly assessed in youngsters), but there is no a common and standard tool for assessing the active commuting to school[12,39]. For example, the studies ask for different trip directions (i.e. go to school, come back from school or go and come back from school) or different recall periods (i.e. today, yesterday, usually, the last year, etc.), making difficult to compare across studies the obtained result. Apart from the direct question about how student commute to school, other similar methods are used such as questionnaires which contains mode of commuting to school questions (i.e. the Assessing Levels of Physical Activity and fitness (ALPHA) questionnaire for adolescents or the IPAQ adolescent version)[40,41], direct observation[42] or to ask student to raise their hands[43].

Apart from self-reported methods, accelerometry is used to obtain objective data when commuting. Accelerometry is a valid and feasible tool for measuring the amount and intensity of PA[44], and it is also the most used objective method for PA measurement. Accelerometry is appropriate to measure total movement in a given time frame but it is a weak method to distinguish PA types[45]. It is common to find studies that quantify the PA level of the active commuting behaviours and its implications in the total PA using accelerometers[14,17,46,47]. Studies analysing the correlation between active commuting and objectively measured PA are scarce. Two studies analysed this correlation in adults and older adults and found moderate to strong correlations between self-reported PA for

commuting and objective measured PA levels[36,48]. In young people, only two studies analysed the correlation between active commuting and objectively measured PA when commuting to and from school and during leisure time, and no correlation was found[49], except for adolescents' girls[40]. However, studies validating the mode of commuting using number of steps in youth or adults were not found. Most of the studies focused in youth validated the questionnaire using parent reports and they found convergent validity when comparing the parent and children reports[50,51].

The distance and time from home to school has strong importance when studying active commuting to school[52]. Shorter distances are associated with higher rates of active commuting to school[53–56]. Self-reported questions might be the easiest and fastest method to assess the distance and time for commuting, but inaccuracies on reporting this distance or time may have an impact in the measure, especially in young people[57]. Objective methods for measuring the travel distance and time used in the literature have been Global Position Systems (GPS), Geographical Information Systems (GIS) or Google Maps™ [58,59]; the cheapest and feasible method is Google Maps™ [58]. Previous studies that validated the distance and time when commuting using objective measurements focused only on driving travel[58,59]. Only a recent study focused in young people showed high correlation and concordance between Google Maps™ and GIS for walking routes[60].

2. Active commuting in women with Fibromyalgia.

2.1. Definition, aetiology and burden for the health care system.

Fibromyalgia is a multi-symptomatic disorder of unknown aetiology, related to alterations in pain modulation in the central nervous system[61–63]. The central nervous system pain amplifications are new concomitants to the traditional definition of the illness[64]. Symptoms usually reported by fibromyalgia patients are altered sleep patterns, fatigue, cognitive difficulties, mood disturbance, paraesthesia and depression[65–67], showing worse health compared with other pain condition patients[66]. In terms of general health, fibromyalgia sufferers demonstrate a debilitated functional capacity[65–68], which limits their daily activities and lowers their quality of life[69]. The prevalence of fibromyalgia varies from 0.5% to 5% depending on the country[70], although rates higher than 10% were found in United Kingdom, United States and Germany[71]. This differences might be explained by the different definitions of pain used[71]. In Spain the prevalence of fibromyalgia is 2.4%, being more frequent in women (4.2%) than in men (0.2%)[69].

Patients with fibromyalgia are high consumers of health care resources (e.g. use of health services and greater number of medications)[72] and higher disease severity leads to greater healthcare costs[73]. Although the use of healthcare resources decrease after fibromyalgia diagnosis[74], due to the chronic nature of fibromyalgia, patients incurs in a considerable extra health care costs[69,75]. Moreover, highest unemployment rates (6%)[76], claims for disability benefits (up to 30%)[75] and require even more days of absence from work amongst European[75–77] have been found in fibromyalgia patients. In the primary care setting in Spain, fibromyalgia patients produce a considerable higher annual total cost compared with the reference population (i.e. who did not have a claim for fibromyalgia syndrome)[75]. Additionally, after controlling by sex an age, this study carried out in Spain reveal a total incurred cost of €614 more in average annual health care cost (direct cost) and €4,397 indirect cost of fibromyalgia patients in comparison with the reference group[75]. Thus, this implies an extra total annual cost of €5,011 per fibromyalgia patient. The inclusion of healthy behaviors in their daily routines might reduce the symptomatology, and hence the consumption of health resources.

2.2. Diagnosis and treatment of fibromyalgia.

The absence of a gold standard for the diagnosis of the fibromyalgia is the main problem found[78]. In 1990, Wolfe et al.[67] published the American College of Rheumatology (ACR) criteria for the classification of the fibromyalgia, being the first criteria known. In this criteria, the fibromyalgia diagnosis was mainly based on the identification of tender points. The 1990 ACR fibromyalgia criteria are met when a person reported widespread pain for at least 3 months and pain pressure ≤4kg/cm^2 for at least 11 of the 18 fibromyalgia-tender points[67].

Picture 2. Tender points' examination. (Source: Manuel Herrador-Colmenero)

However, fibromyalgia has been defined as a complex multidimensional pain disorder[78,79]. Therefore in 2010, Wolfe et al.[78] reviewed the fibromyalgia criteria and proposed the ACR new preliminary diagnosis criteria for fibromyalgia, which was validated in Spanish population[80]. This new proposal was based on the simplification of the clinical diagnosis. Furthermore, to avoid the physicians' subject assessment, the 2010 ACR fibromyalgia criteria was modified in 2011[81]. The combination of the 1990 and 2010 ACR fibromyalgia criteria have been recommended (meeting one of the two), since showed better diagnosis characteristics[80].

Pharmacological intervention in patients with fibromyalgia have been revealed significant benefits on pain and quality of life compared with placebo[82], although the clinical relevance might be questionable (significant differences of 0.6 cm in a Visual Analogue Scale ranged 0 to 10 cm). Among non-pharmacological treatments, multidisciplinary therapies[83], cognitive behavioural therapies[84,85], exercise[86,87] and PA[88,89] might be an alternative in the disease management interventions.

2.3. Physical activity and fibromyalgia.

In the general population, a sedentary lifestyle has negative consequences on health[90]. In patients with fibromyalgia, symptoms as pain, fatigue, fibromyalgia severity or the reduction of the sleep quality were associated with sedentary lifestyles[91,92]. Furthermore, women with fibromyalgia spend more time in sedentary behaviours compared with healthy counterparts[93]. Participation in PA is associated with more favourable pain modulation, fibromyalgia impact, depression and fatigue[88,89,91,94–96] and greater health related quality of life[94]. A recent study has shown that exercise have an effect upon brain processes that influence the modulation of pain in patients with fibromyalgia[89]. Moreover, all kind of PA intensities have been associated with a reduction on fatigue[91]. And a higher number of steps/day is associated with a reduction on pain[97], being both PA intensities and steps/day associated with a reduction on the fibromyalgia impact[91,97]. Therefore, women with fibromyalgia might reduce their symptomatology[91] reducing the sedentary time,. Turning sedentary time into PA throughout active commuting might help women with fibromyalgia to reduce symptomatology[98].

Previous studies concluded that socioeconomic factors such as intrapersonal, interpersonal, institutional, community, and environmental factors are related to active commuting[99]. It has been shown significant relationships between active commuting behaviour in adult women and marital status[99], living alone/accompanied[100,101], educational level[99,102] and employment[99,100]. Furthermore, levels of PA have been associated with perceived environment among adults and elderly

people[103–105]. However, it is necessary to know if these associations remain among fibromyalgia female suffers, because they are less physically active than healthy females[106].

Among the different contexts in which PA can be performed (i.e., work or study, commuting, domestic tasks and activities on leisure time)[16], walking or cycling for commuting purposes appears as an opportunity to increase PA, especially in women, being the promotion of active commuting a potential public health strategy to increase PA[17,18,22,107]. However, there is no previous evidence about the association of commuting by walking and fibromyalgia symptomatology. Despite healthy benefits, it has been found that walking for commuting purpose decrease in the early adulthood, and remain stable after 35 years approximately[38]. Active commuting might help in the management of fibromyalgia symptomatology, but it is unknown whether the benefits observed in general population might be generalized to fibromyalgia patients. A recent study in women with fibromyalgia evidenced that unsupervised but structured walking (to walk as physical exercise for treatment without a specialist's supervision) was associated with a decrease in fatigue perception[96]. However, some patients perceive walking as a challenging activity that might worsen symptomatology[108,109] and might avoid this behaviour. These perceptions could reduce active commuting in this population, despite the potential health-related benefits that are to be studied.

3. Active commuting in young people.

3.1. Prevalence.

Active commuting to school is a PA behaviour occurring daily in specific frame times before and after school. Children and adolescents generally commute to and from school each school day, providing at least two daily opportunities to be physically active if they choose active modes of commuting.

Nevertheless, the prevalence of active commuting to school has declined in recent decades. It has been reported a decreased active commuting trend in countries such as Canada (decrease a 8-11% between 1986 and 2006)[110], United States (decrease a 35% between 1969 and 2009)[111–113], Australia (decrease a 23-32% between 1971 and 2003)[114], England (decrease a 9% between 1975 and 1994)[115], Brazil (decrease a 12% between 2005 and 2012)[116], Vietnam (decrease a 8% between 2004 and 2009)[117], Switzerland (decrease a 7% between 1994 and 2005)[118] and Spain (decrease a 15% between 2001 and 2007)[119]. In spite of all these alarming news, Merom et al.[120] did not find changes in active commuting between 2004 and 2010 in Australian children, becoming a positive finding. Moreover, some studies have reported increases of active commuting rates when a promotion of active commuting was conducted. For example, Hinckson et al.[121] found increases of active commuting to school in Australian children after 3 years of implementation of the School Travel Plan (combination of engineering, education, enforcement, encouragement, and policy strategies). In Spain, Villa-González et al.[122] found increases in the number of walking to school trips after a 6 month intervention focused in individual factors such as children perceptions and children attitudes. Therefore, developing strategies and tools which lead the promotion of active commuting behaviours is essential to fight against the negative prevalence and trends observed in the last 40 years.

Picture 3. Children commuting actively to school. (Source: Manuel Herrador-Colmenero)

3.2. Facilitators and inhibitors.

To understand active commuting to school behaviour, Panter et al.[57] established four determinant of the active commuting to school behaviour in children (see Picture 4):

a) Main moderators: age, gender and distance between home and school.
b) Individual factors (of parents and youths): perceptions of the environment, characteristics and attitudes.
c) Physical environmental factors: attributes of neighbourhood, attributes of destination and surroundings, and attributes of route.
d) External factors: weather or government policy among others.

The main moderators are not modifiable determinants for active commuting to school behaviours. Age is a main moderator of active commuting to school[53,123,124]. The prevalence of active commuting decrease with age, being maintained or increased up to 10-12 years and having an exacerbated decrease after these ages[18,125]. However, other studies reported higher rates of active commuting to school with age[126,127], being a no conclude evidence of the association between age and active commuting. Regarding gender, several studies found that male adolescents are more likely to commute actively to school than females, who prefer to commute with passive modes[55,128,129]. However, recent studies did not find differences between by gender in children and adolescents, although the percentages of active commuting were higher among males[53,54]. Finally, the distance from home to school has been strongly associated with active commuting to school. Shorter distances were associated with higher rates of active commuting to school[53–56]. Rodríguez-López et al.[54] identified in Spanish children and adolescents the threshold distance below which young people are more likely to walk to school; these distances were 875 meters for children and 1,350 meters for adolescents.

Perception, characteristics and attitudes of parents and young people are individual factors which play a key-roll in the process of choosing the mode of commuting to school. Parents are the family member who allow behaviours like active commuting to school or even they are who decide the mode of commuting in their children. Parents' perception about distance[56] and safety[130,131] are determinant to take the decision on the mode of commuting to school of their children[132]. Due to the cultural and environmental differences between countries, it is of interest to know the parents' perceived barriers of each context. In Spain, a recent study carried out by Huertas-Delgado et al.[133] identified traffic volume and dangerous intersections as the main barriers to active commuting in parents of children, meanwhile in parents of adolescents, distance and dangerous intersections were reported. In a different way, while parents' perception are focused on safety issues, children and adolescents' perceptions are mainly focused on environmental concerns (e.g. distance, connectivity, land use mix walkability and infrastructures), perception on traffic, weather or time for commuting in the morning[52,128,134]. Regarding family (parents and youngsters) characteristics, higher socioeconomic level was associated with less active commuting to school in countries such as Australia[135], Canada[136,137], United States[138,139], England[140], Portugal[141,142] or Spain[127,132]. Car ownership is one of the socioeconomic characteristic negative associated with active commuting to school more studied[53,124,139,143]. A systematic review carried out by Pont et al.[144] identified 16 studies that analyse the association between this behaviour and car ownership. Nine of these studies displayed negative associations and 7 did not find associations, while no study were found reporting positive associations. Moreover, highest education level of the parent was inversely correlated active commuting[139,140,142,145] and occupational status of them was also negatively associated with active commuting to school[127,142].

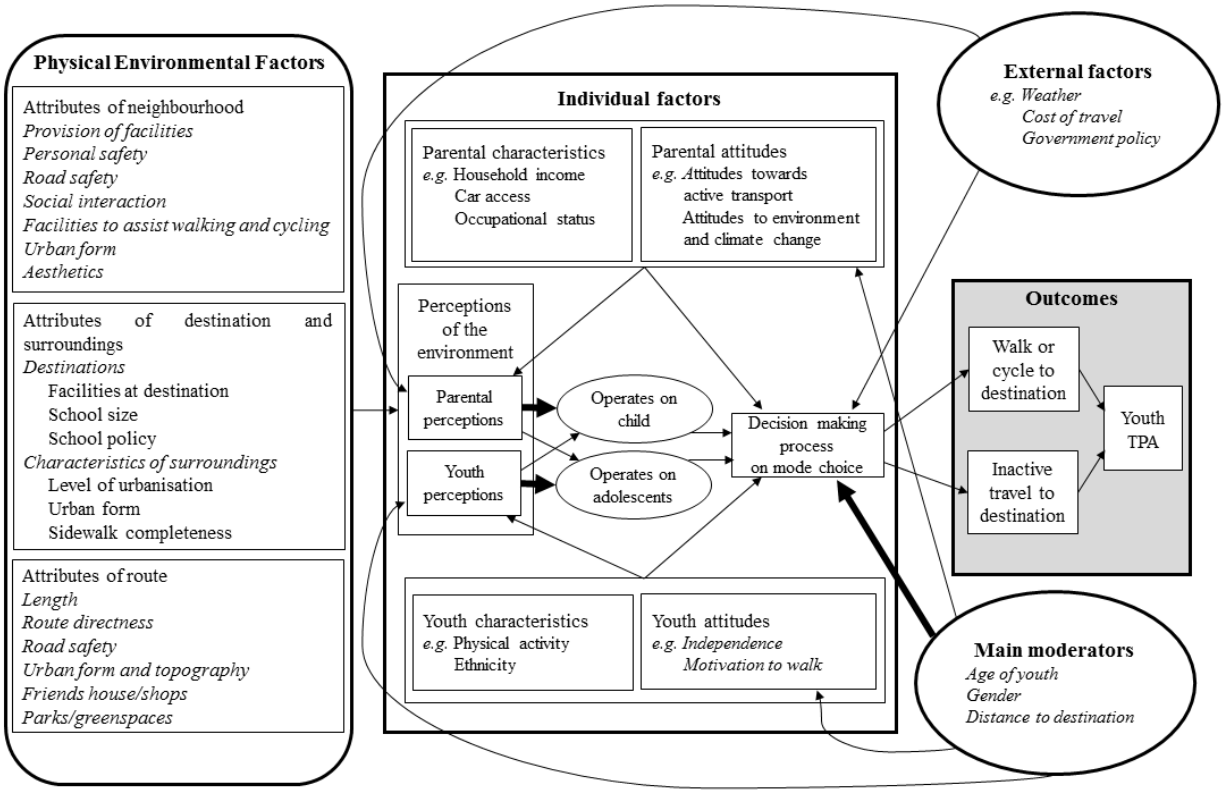


Figure 1. Conceptual framework of the determinants to active commuting to school in children. Proposed by Panter et al. (2008)

The attributes of the environment (i.e. neighbourhood, destination, surroundings and route) in the commuting to school behaviour have been widely analysed. Several positive factors for active commuting to school have been found, being the school setting one of the most highlighted. Active commuting to school has been positively associated to urban areas[54,125,146–148]. Other factors identified have been walkability[55,149–151], safety perception of the neighbourhood[55,143,152], land use mix diversity[128,153], social support[55,151], higher residential density[154], the presence of sidewalks[154], street trees[153,155], access to shops[128,150,154] or public transport[128], the presence of public parks/bike lanes[128], higher intersection density[154,156] and accessible well-maintained paths[128]. There is previous evidence of successful policy intervention to promote active commuting to school, such as the developed by Villa-González et al.[122] in which active commuting to school in children was increased even beyond the period of the intervention.

In terms of external factors, weather conditions have been associated with travel mode choice[52,157]. Parental perception of the weather seems to inhibit active commuting to school[158] in United States, and a study of Belgian adolescents reported a preference for motorised transport in wet weather[159]. However, findings from the few quantitative studies that have explored associations between weather conditions and active commuting to school are equivocal. A longitudinal study showed that higher temperature was positively associated with more active commuting to school in 2,711 North American children[158], but a Canadian study found that weather conditions were not associated with walking to school[160]. Other cross-sectional and longitudinal studies did not find associations between active commuting to school and weather[161–164]. However these studies have been limited by restricted data collection periods (limiting variability in weather conditions), small samples, cross-sectional designs (so that only differences between people, and not within them over periods of time can be assessed), and the use of

usual mode of travel as a proxy for mode choice on a given day. Additionally, previous evidence has considered weather conditions in relation to active commuting to school behaviour using measures from the full day, which might not be temporally specific enough to identify relationships between weather conditions and the choice of mode of commuting to and from school[161].

Finally, government policies are understood in this framework as an integration of active commuting into both urban planning and educational policies (for a sustainable transportation). The city of Pontevedra (Spain), modified its urban planning in order to encourage active commuting behaviours; but to find studies that analyse the possible effects of the urban planning interventions in the scientific literature are lacking. Educational policies might be easier to incorporable than urban planning because the investment may be lower. In projects such as the European Project Stars, the European Project Capas-Cité, the Safe Routes to School program or the Project Caminos Escolares Seguros, local governments work to increase the use of sustainable and active modes commuting to school beside other community groups (e.g. schools, society…). Some more research evidence there is about these educational policies, in which higher rates of active commuting to school were produced when the local government was involved[122,165].

3.3. Independent mobility.

Apart from the binomials active vs. passive commuting, there is another binomial concept of independent vs. dependent commuting (or mobility), regarding that this behaviour is unsupervised or supervised by adults. In theory, the best mode of commuting might be active and independent. Children's independent mobility has been defined as the "freedom to travel around their own neighbourhood or city without adult supervision"[166]. Children's independent mobility can improve their psychological health[167], self-efficacy[168] and autonomy[169]. However, comparing with previous decades, the independent mobility has decreased in children[170], due to parents' unsafe perception or families' daily life.

Furthermore, those students who are younger have less responsibility for choosing the mode of commuting than adolescents[130]. Previous studies found in children that mobility allowance has been associated with higher rates of active commuting to school without adult supervision[171], but for those students who walked to school, younger children are more likely to walk accompanied by an adult in comparison with older children[131]. The reason of this fact might be that children's allowance firstly, and mode of commuting secondly, are parents' decisions and its perception is determinant in the mode of commuting of their children[132]. Parents found distance as the first determinant[56], followed by safety[130], to commuting to school actively. Parents' safety perceptions on the neighbourhood has been previously associated with independent mobility in children[130,131], whereas short distances have been associated with active commuting to school[56].

The autonomy concept is acquiring relevance in current families, for safety concerns. For example, regarding independently mobility, parental permission is one of the main barriers[172], and possibly it is produced by the parents' concern about safety. However, active commuting to school is an opportunity to develop the autonomy among children, and as a consequence, some studies have associated physical activity behaviours with autonomy[173,174]. In a physical activity framework, autonomy has been positively predicted by autonomy education, autonomy support, and social goals[174]. For that reason, children with access to autonomy experiences on daily physical activity tasks might improve their autonomy. For children, active commuting to school appears as an opportunity to experience their autonomy.

OBJETIVOS

Echosmith
Talking dreams (2013)
Come together

OBJETIVOS

Los principales objetivos de la presente Tesis Doctoral fueron estudiar el modo de desplazamiento en mujeres con fibromialgia y en población joven al colegio, así como analizar variables individuales y ambientales asociadas a este comportamiento. Los resultados de esta Tesis Doctoral se organizan en nueve estudios, basados en los siguientes objetivos específicos:

Proyecto I: Desplazamiento activo en mujeres con fibromialgia – El proyecto al-Ándalus (estudios I a IV).

1. Estudio I. Analizar la fiabilidad de la versión española del cuestionario medio ambiental "Assessing Levels of Physical Activity and fitness" y del cuestionario de modo de desplazamiento; y estudiar la asociación entre ambiente y niveles de actividad física y modo de desplazamiento con niveles de actividad física en pacientes con fibromialgia.

2. Estudio II. Comparar los patrones de desplazamiento entre mujeres con fibromialgia y controles llevado a cabo en dos grupos de edad; y estudiar las asociaciones entre desplazamiento activo y factores socioeconómicos en mujeres con fibromialgia.

3. Estudio III. Analizar la asociación entre el desplazamiento activo con el tiempo sedentario y actividad física medidos objetivamente en mujeres con fibromialgia.

4. Estudio IV. Evaluar si las variables sintomatológicas difieren por el modo de desplazamiento en mujeres con fibromialgia en relación a la edad; y analizar la asociación de las variables sintomatológicas con el modo de desplazamiento por edad.

Proyecto II: Desplazamiento activo en jóvenes sanos – El proyecto PACO (Pedalea y Anda al Cole) (estudios V a IX).

5. Estudio V. Analizar las medidas auto-reportadas usadas para evaluar los modos y frecuencias de desplazamiento hacia y desde el colegio en niños (4-18,5 años). También se valoró la calidad de conseguir medidas auto-reportadas e identificar temas para medir el desplazamiento al colegio en estudios futuros.

6. Estudio VI. Estudiar la validez convergente del Cuestionario de Modo y Frecuencia de Desplazamiento hacia y desde el Colegio usando pasos y actividad física medida objetivamente con acelerometría; y comparar el tiempo de viaje objetivo determinado por Google Maps™ vs. al auto-reportado en niños y adolescentes.

7. Estudio VII. Estudiar las diferencias entre modo de desplazamiento en el trayecto de ida y de vuelta del colegio; y analizar las diferencias entre los patrones usuales de modo de desplazamiento y el número de viajes en la última semana en un modo de desplazamiento, hacia y desde el colegio.

8. Estudio VIII. Analizar si las condiciones climáticas están asociadas con la elección del modo de desplazamiento para desplazarse hacia y desde el colegio; y si las condiciones climáticas modifican el modo usual de desplazamiento hacia y desde el colegio.

9. Estudio IX. Describir el modo de acompañamiento en el comportamiento de desplazarse activamente al colegio; e identificar el impacto de la percepción seguridad dependiendo del modo de acompañamiento en niños que se desplazan activamente al colegio.

AIMS

Marvin Gaye & Tammi Terrell
United (1967)
Ain't No Mountain High Enough

AIMS

The main aims of the present Doctoral Thesis were to study the mode of commuting in women with fibromyalgia and in healthy young people to school, and to analyse individual and environmental variables associated to this behaviour. The outcome of this Doctoral Thesis is organised in nine studies, based on the following specific aims:

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV).

1. Study I. To analyse the reliability of the Spanish version of the Assessing Levels of Physical Activity and fitness environmental questionnaire and the mode of commuting questionnaire, and to study the association between environment and PA levels and mode of commuting with PA levels among female fibromyalgia patients in southern Spain.

2. Study II. To compare the patterns of commuting between women with fibromyalgia and control women conducted separately in two age groups; and to examine the associations between active commuting and socioeconomic factors in women with fibromyalgia.

3. Study III. To examine the association between active commuting and objectively measured sedentary time and PA in women with fibromyalgia.

4. Study IV. To assess if symptomatology variables differ by mode of commuting in women with fibromyalgia regarding the age, and to examine the associations of symptomatology variables with the mode of commuting by age.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

5. Study V. To analyse in detail the self-report measures used for assessing modes and frequency of commuting to and from school in children, aged 4–18.5 years old. We also appraised the quality of reporting self-report measures and identified issues for measuring commuting to school in future research.

6. Study VI. To study the convergent validity of the Mode and Frequency of Commuting to and from School Questionnaire using objectively measured steps and PA with accelerometry and to compare the objective vs self-reported journey time determined by Google Maps™, in children and adolescents.

7. Study VII. To study the differences between the mode of commuting on the way to and from school; and to analyse the differences between the patterns of usual mode of commuting and the number of daily journeys in the last week on the mode of commuting, to and from school.

8. Study VIII. To analyse if weather conditions are associated with the travel mode choice for commuting to and from school and if weather conditions modify the usual mode of commuting to and from school.

9. Study IX. To describe the accompaniment on the active commuting to school behaviour; and to identify the impact of safety perception depending on accompaniment mode in children who commute actively to school.

MATERIALS AND METHODS

Supersubmarina
Santacruz (2012)
Canción de guerra

MATERIALS AND METHODS

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV).

Design and participants

The first project whitin this Doctoral Thesis is the al-Ándalus project, and a previous pilot project of this. The al-Ándalus project is a population-based cross-section study that aimed to recruit a representative sample of women with fibromyalgia from Andalusia Region (southern of Spain). To assure a geographical representativeness, a two-phase (sex and province) proportional sampling of fibromyalgia was planned. Database of the Spanish Association of Rheumatology, as well as the Census of the eight provinces of Andalusia, were used as reference to proportionate the sampling procedure. The level of accuracy was used as a fraction (k) of the standard deviation of the population (accuracy = k × standard deviation). A standard deviation of 10%-50% was selected, being these percentage habitual in clinical studies. Thus, for a confidence interval of 95%, a total of 240 women were needed to obtain and accuracy of 11%. In order to prevent loss information, the final sample was oversized.

The Pilot project was conducted in patients from local association of women with fibromyalgia from Granada (Spain). We finally contacted 116 potentially eligible women, who gave their written informed consent after receiving detailed information in a meeting in which the aims of the study and procedures involved were explained.

For the al-Ándalus project, we contacted a total of 874 women (617 fibromyalgia patient and 257 control) from Andalusia via e-mail, letter or telephone between 2011 and 2013 (cross-sectional study of the al-Ándalus project). All the participants gave their written informed consent after receiving detailed information about the aims of the study and procedures involved.

The inclusion criteria (see Table 1) for fibromyalgia women in both Pilot and al-Ándalus projects were a) to meet the 1990 ACR Fibromyalgia criteria[67] and b) not having severe or terminal illness (i.e. cancer, stroke, recent cardiomyopathy, sever coronary disease, schizophrenia and severe chronic obstructive pulmonary disease) nor severe cognitive impairment (Mini-Mental State Examination (MMSE)>10)[175]. The inclusion criteria for the control group in the al-Ándalus project were: a) not to meet the 1990 ACR Fibromyalgia

Table 1. General overview of the inclusion criteria carried out in the Project I: Active commuting in women with fibromyalgia - The al-Ándalus project.

Fibromyalgia participants				
	Pilot project	The al-Ándalus project		
Inclusion criteria	Study I	Study II	Study III	Study IV
To meet the 1990 ACR FM criteria	X	X	X	X
Not to have acute/terminal illness nor severe dementia	X	X	X	X
To be previously diagnosed of FM by a rheumatologist		X	X	X
To be aged ≥37 years or ≤65 years		X		
To have accelerometry data (≥10 hours during 7 days)			X	
To have full data on mode of commuting			X	X
To have full data on symptomatology				X
Control participants				
	Pilot project	The al-Ándalus project		
Inclusion criteria	Study I	Study II	Study III	Study IV
Not to meet the 1990 ACR FM criteria		X		
Not to have acute/terminal illness nor severe dementia		X		
To be aged ≥37 years or ≤65 years		X		

ACR, American College of Rheumatology; FM, Fibromyalgia.

criteria[67] and b) not to have acute or terminal illness nor severe dementia[175].

Some additional inclusion criteria were set for the studies that compose the Project I of the present Doctoral Thesis:

- Study II: to be previously diagnosed of fibromyalgia by a rheumatologist for fibromyalgia participants, and to achieve age-matched groups between fibromyalgia and control participants, those participants aged <37 years or >65 years were not included in the study.
- Study III: to be previously diagnosed of fibromyalgia by a rheumatologist, to have accelerometry data on a total of 7 days recording with a minimum of ten or more hours' registration per day and to have full data on mode of commuting questions.
- Study IV: to be previously diagnosed of fibromyalgia by a rheumatologist and to have full data on symptomatology variables and mode of commuting questions.

The studies comprised in the Project I of the current Doctoral Thesis were performed following the ethical guidelines of the Declaration of Helsinki. The ethical approval was obtained from the Ethics Committee of the "Hospital Virgen de las Nieves" (Granada, Spain), and all the participants gave written informed consent.

Protocol

The evaluation process performed slightly varies between the Pilot and the al-Ándalus project. Table 2 presents an overview of the global assessment procedures undertaken. All the participants from the Pilot project attended two questionnaire administering sessions at University of Granada, separated a period of 9 days. On the first day, participants completed the International Physical Activity Questionnaire (IPAQ), the MMSE, the self-administered ALPHA and the mode of commuting questionnaire. Moreover, the 1990 ACR fibromyalgia criteria were carried out. The participants were asked to wear an accelerometer for 9 consecutive days for the duration of the day except during activities such as showering or swimming. At the second appointment, participants completed the self-administered ALPHA and the mode of commuting questionnaire again and returned the accelerometer to the researchers.

Participants from the al-Ándalus project took part in an evaluation process which was performed on two alternate days (e.g. Tuesday and Thursday) either at the local University facilities or at local fibromyalgia associations. The assessments were carried our either in morning and afternoon sessions, according to the participants' convenience. The same

Table 2. General overview of the assessment carried out in the Project I: Active commuting in women with fibromyalgia - The al-Ándalus project.

Pilot project		The al-Ándalus project	
Assessment day	Assessments	Assessment day	Assessments
Day 1	MMSE, tender point examination, IPAQ, ALPHA, the mode of commuting questionnaire and accelerometry.	Day 1	MMSE, tender point examination, body composition, socio-economic characteristics and BDI-II.
		Home	ALPHA, the mode of commuting questionnaire, FIQR (SIQR for control participants), SF-36, PSQI, PCS, CPSS and MFI-S.
Day 2	ALPHA and the mode of commuting questionnaire.	Day 2	Check questionnaires and accelerometry.

ALPHA, Assesing Levels of Physical Activity; BDI-II, Beck Depression Inventory-second edition; CPSS, Chronic Pain Self-efficacy Scale; FIQR, Revised Fibromyalgia Impact Questionnaire; IPAQ; International Physical Activity Questionnaire; MFI-S, Multidimensional Fatigue Inventory; MMSE, Mini-Mental State Examination; PCS, Pain catastrophizing Scale; PSQI, Pittsburgh Sleep Quality Index; SF-36, 36-items Short Form health survey; SIQR, Symptom Impact Questionnaire.

research team carried out the whole evaluation process, being previously trained.

On day 1, the MMSE[175] was applied in a private room for inclusion purposes and the diagnosis of fibromyalgia, which it was confirmed by means of tender points' examination[67], performed by a single trained research,. Moreover, anthropometric measurements and body composition were assessed, and participant filled a complete self-reported socio-demographic questionnaire and the Beck Depression Inventory-second edition (BDI-II) questionnaire. Participant were given several questionnaires (see Table 2) to fill at home and bring on the next assessment day. During day 2, the questionnaire were verified by the research team that were properly and completely filled. Thereafter, participants were instructed to wear an accelerometer during 9 days.

Measurement of variables

From the Pilot project is derived the Study I, and from the al-Ándalus Project are derived the Studies II to IV. Table 3 presents an overview of the design, participants and variables used in each study. Detailed information about variables is explained as follow.

Cognitive impairment

The MMSE was used to assess the presence of severe cognitive impairment for exclusion purposes[175]. The Spanish version[176] was used, and it consist in 30 items which assess the five areas of cognitive functioning: orientation, immediate memory, attention/concentration, delayed recall and language. The MMSE ranges from 0 to 30, were severe cognitive impairment was considered as the MMSE score <10[175].

Tender points' examination

Standard pressure algometry (FPK 20; Wagner Instruments, Greenwich, CT, USA) was used to perform the tender points examination according to the 1990 ACR Fibromyalgia criteria for classification of fibromyalgia[67]. Two alternative measurement in each one of the 18 fibromyalgia-related tender points[67] were performed. Participant were asked to say "stop" when pain appear while an increasing pressure was applied with the algometer. A pressure threshold $\leq 4 kg/cm^2$ defined a positive tender point. The total number of tender points count was recorded for each participant and the total algometer score was recorded as mean. Additionally, the mean values of tender point was recorded as pressure pain threshold.

Body composition

Body fat percentage was meassured using a valid and reliable[177,178] portable eight-polar tactile-electrode impedianciometer (InBody R20; Biospace, Seoul, Korea). Participants were asked to avoid lunch in the previous two hours before the measurement and released from clothing and metal objects. Height (cm) was measured using a portable stadiometer (Seca 22, Hamburg, Germany).

Picture 4. Example of body composition measurement in the Project I.
(Source: Manuel Herrador-Colmenero)

Socioeconomic characteristics

A complete self-reported socioeconomic questionnaire was filled by each participant. Age, years since diagnosis, civil status, accompaniment at home, educational level and

occupational status were measured. Years since diagnosis was categorised as ≤5 years and >5 years while civil status (i.e. married, single, separated, divorced or widowed) was categorised as married and no married (i.e. single, separated, divorced or widowed). Accompaniment at home was classified as accompanied and alone, and who they were living with was classified as partner and children, only partner, only children and alone. Educational level was classified in four categories: University degree, Secondary school/Professional training, Primary school and no studies; current occupational status was classified in two categories: working/studying and unemployed/retired; and the professional status was classified in three categories high, medium and low qualification. Professional status was adapted from the Spanish National Health survey 2006.

Depression

The Beck Depression Inventory (BDI-II)[179] was used to assess depressive symptoms. In chronic pain patients, the internal consistency has been reported to be of α=0.92[180]. This tool provide 21 items and in the context of the past 2 weeks, participants rate each item on a 0-3 scale (0=not present; 3=severe). From the overall score (range 0-63) provided by the BDI-II, a score of ≤13, 14–19, 20–28, and ≥29 represents minimal, mild, moderate, and severe depressive symptoms[179].

Environmental perceptions

The ALPHA environmental questionnaire concerning perception of the physical environment was developed within the ALPHA project (www.thealphaproject.net)[181,182]. We used the Spanish version of the questionnaire. The questionnaire contained 9 theme, 15 scales and 47 items. The following participants concerning the physical environment within the neighbourhood were covered: (1) type of residence (1 scale; 3 items); (2) distance to cycling infrastructure (3 scales; 4 items); (4) maintenance of infrastructure (1 scale; 3 items); (5) neighbourhood safety (3 scales; 6 items); (6) pleasantness of the neighbourhood (2 scales; 4 items); (7) walking and cycling network (2 scales; 4 items); (8) home environment (1 scale; 6 items); and (9) workplace or study environment (1 scale; 10 items). Each item provided several answer categories either on a 4–6 point Likert scale or as a simple dichotomous yes/no answer.

In accordance with the ALPHA manual, we calculated sum scores with the items for obtaining the scale in each participant (see tables 8 and 9 in result section). We recorded adverse items of the scales to provide a uniform interpretation of the applied scored.

Mode of commuting

Mode of commuting was self-reported by participants using four questions. The mode of commuting questions refers to four different destinations: local shops, supermarket, local services and study/work place. For studies III and IV, the item of commuting to study/work was not used, due to the low number of participants who reported studying or working. The responses for each question were; walking, cycling, by car, riding a motorcycle, by bus/metro/train and others; only one of them could be chosen. The four mode of commuting questions were recorded as active (i.e. walking and cycling) or passive (using car, motorcycle and by bus/metro/train). The option "other" was included as active or passive if participants specified the mode of transportation, but if it was not, this response was excluded from the analysis.

A sum of the three items (i.e. commuting to local shops, commuting to supermarket and commuting to local services) using the dichotomised variable (active vs. passive) generated the scale commuting four levels (i.e. strongly passive, passive, active and strongly active), and a global dichotomical variable was recorded adding the previous 3 dichotomical

variables for each destination: none or one active response was recoded as passive; and two or more active response were recoded as active. A sum of the four items (i.e. commuting to local shops, commuting to supermarket, commuting to local services and commuting to study or work) using the dichotomised variable (active vs. passive) generated the scale commuting five levels (i.e. strongly passive, passive, active, moderately active and strongly active). A global dichotomical variable was recorded adding the previous 4 dichotomical variables for each destination: none or one active response was recoded as passive; and two or more active response were recoded as active.

Fibromyalgia Impact

Participants self-reported the Spanish version[183] of the Revised Fibromyalgia Impact Questionnaire (FIQR)[184], comprising 21 individual questions with a rating scale of 0–10. These questions compose 3 different domains: function, overall impact, and symptoms score[184]. We used the Symptom Impact Questionnaire (SIQR) with control participants. The SIQR[185] is a slightly modified version of the FIQR used with non-fibromyalgia patients (number of questions, domains, and scoring is the same as the FIQR). The FIQR total score and SIQR total score ranges from 0 to 100, with a higher score indicating greater effect of the condition on the person's life.

Health-Related Quality of life

To assess the physical and mental components of the Health-Related Quality of Life (HRQoL), the Spanish version[186] of the 36-item Short-Form Health Survey (SF-36)[187] was used. The instrument assesses 8 health domains (each domain ranges from 0-100): limitations in physical activities because of health problems, limitation in social activities because of physical or emotional problems, limitation in usual role activities because of physical health problems, bodily pain, general mental health, limitations in usual role activities because of emotional problems and general health perceptions. The standardized physical and mental component summaries (range 0-100) were used, where higher scores represent better physical and mental HRQoL. The SF-36, which has been widely used in women with fibromyalgia, has an internal consistency of α=0.90[188].

Picture 5. Questionnaire verification. (Source: AFICAR)

Sleep Quality

The Spanish version[189] of the Pittsburgh Sleep Quality Index (PSQI)[190] was used to assess the sleep quality in the current study. The PSQI total score range from 0 to 21, where higher scores represent worse sleep quality.

Pain catastrophizing

Pain related catastrophizing was assessed with the Pain Catastrophizing Scale (PCS)[191]. This scale is a 13-item questionnaire in which women were asked to reflect on past painful experiences and indicate their thoughts or feelings about pain. Each item includes a 5-point scale. The total score (range 0–52) was used, where higher scores represent a more negative appraisal of pain.

Chronic Pain Self-efficacy

Efficacy expectations for coping with pain was assessed with the Spanish version[192] of the Chronic Pain Self-Efficacy Scale (CPSS)[193]. This questionnaire contains 19 items grouped in coping, function and pain subscale. A total

score was calculated with the sum the three subscales (range 0–300), where a higher score is a better result.

Fatigue

Fatigue severity was assessed with the Spanish version of the Multidimensional Fatigue Inventory (MFI-S)[194,195]. This questionnaire is composed by 5 scales: general fatigue, physical fatigue, reduced activity, reduced motivation and mental fatigue. Four items are comprised in each subscale with five-point Likert scales. Only general fatigue scale were used and score range from 4 to 20, with higher scores indicating greater fatigue.

Physical activity

Physical activity was assessed differently in Pilot project and in the al-Ándalus project. Therefore, the methodologies used are described separately.

For the Pilot project, both self-reported and objective tools to measured PA were carried out. The International Physical Activity Questionnaire (IPAQ) long-form was used to measure self-reported PA, which measures domain-specific activity for each intensity-specific category. The questionnaire includes 27 items that identify the frequency (times per week) and duration (minutes or hours per day) of PA performed in different PA domains (leisure time PA, domestic and gardening (yard) activities, work-related PA and transport-related PA) during the previous seven days. For all PA domains, participation in vigorous and moderately intense PA was recorded. For each of the three domains analysed in this study (transport, leisure and domestic), minute/week totals were computed, followed by minute/week for walking, moderate intensity PA, vigorous intensity PA and total PA. According to the IPAQ guidelines, walking as 3.3 METs, moderate intensity was recognised as four metabolic equivalents (METs) and vigorous intensity as 8 METs, being 1 MET the amount of oxygen consumed while sitting at rest and equal to 3.5 O_2 ml×kg^{-1}×min and 1 kcal×kg^{-1}×hr^{-1} as the caloric equivalent for adults[196]. Metabolic equivalents per minute was computed by multiplying METs by minutes of participation in vigorous and moderately intense PAs and walking.

Additionally, in the pilot project, the Actigraph accelerometer model GT1M (Actigraph MTI, Manufacturing Technology Inc., Pensacola, FL, USA) was used to objectively assess PA. The accelerometers were initialized as described by the manufacturer and data were saved in 5-second epoch. The participants wore them beneath their clothing attached on an elastic belt at the waist near to the centre of gravity (i.e. on the right, on the left or on the front), near to the centre of gravity. The data were downloaded onto a computer using the manufacturer's software. Data reduction, cleaning, and analyses were undertaken using the MAHUffe program (see www.mrc-epid.cam.ac.uk).

Bouts of 60 continuous minutes of 0 activity intensity counts were considered to be non-wearing time and excluded from the analysis. Monitor wearing time was calculated by subtracting non-wearing time and sleeping time (recorded in a diary) from the total registered time for the entire day (1,440 min). A recording of more than 20,000 counts per minute was considered to show a possible malfunction of the accelerometer and the value was excluded from the analysis. To minimize wearer reactivity effects from the first and last days of recording were not included in the analysis. To be included in the study, a total of 7 days recording with a minimum of ten or more hours' registration per day were required.

Sedentary and PA levels were set as the time (minutes/day) engaged in light, lifestyle, moderate, and MVPA based upon standardized cut-offs of 100-759, 760-1951, 1952-5724, and ≥1952 counts per minute respectively[197–199]. Total PA was calculated as the sum of all the PA intensities, expressed in minutes per day.

For the al-Ándalus project, women wore an accelerometer (Actigraph GT3X+, Manufacturing Technology Inc., Pensacola, FL, USA) to measure activity counts. Accelerometers were initialized following the manufacturer's instructions, saving data in 60-second epochs. The device was worn on the waist, secured with an elastic belt near to the centre of gravity.

Monitor wearing time was calculated by subtracting the sleeping reported time (recorded through a diary) from each day. Bouts of 90 continuous minutes of 0 activity intensity counts were considered to be non-wearing time and excluded from the analysis[200]. Physical activity was recorded up to 9 days, starting from the day the participants received the accelerometers until the day that they were instructed to return the devices. The first and last days of recording were not included in the analysis (incomplete days). To be included in the study, a total of 7 days recording with a minimum of ten or more hours' registration per day were required.

Sedentary time and PA levels were set as the time (min/day) engaged in light, moderate, vigorous and MVPA based upon standardized cut-offs of 0 to 199, 200 to 2689, 2690 to 6166, ≥6166 and ≥2690 counts per minute respectively[201,202]. Total PA was calculated as the sum of the light and MVPA intensities, expressed in minutes per day. Additionally, steps were also recorded (number/day). Data download, reduction, cleaning and analyses were performed using the manufacturer software (Actilife™ 6 desktop).

Table 3. Summary table of the methods used in Project I: Active commuting in women with fibromyalgia - The al-Ándalus project.

Project	Study	Design	Participants	Main variables	Methods
Pilot project from the al-Ándalus project	I. Reliability of the ALPHA environmental questionnaire and its association with physical activity in female fibromyalgia patients: the al-Ándalus project.	Cross-sectional	N=109 FM	Mode of commuting to local destinations (i.e. local shops, supermarket, local services and work/study place), environmental perceptions, ST, PA levels (i.e. light, lifestyle, moderate, MVPA, total PA) objectively measured and self-reported for total, transport, leisure time and domestic activities.	Self-reported mode of commuting, ALPHA environmental questionnaire, accelerometry and IPAQ.
The al-Ándalus project	II. Associations between patterns of active commuting and socioeconomic factors in women with fibromyalgia: the al-Ándalus project.	Cross-sectional	N=459 FM N=214 Control	Mode of commuting to local destinations (i.e. local shops, supermarket, local services and work/study place), civil status, accompaniment at home, living with, educational level, current occupational status and professional status.	Self-reported mode of commuting and socioeconomic factors questionnaire.
The al-Ándalus project	III. Is active commuting associated with sedentary behaviour and physical activity in women with fibromyalgia? The al-Ándalus project.	Cross-sectional	N=420 FM	Mode of commuting to local destinations (i.e. local shops, supermarket and local services), ST, PA levels (i.e. light, lifestyle, moderate, MVPA, total PA) and steps objectively measured.	Self-reported mode of commuting and accelerometry.
The al-Ándalus project	IV. Active commuting is associated with impact of fibromyalgia, health related quality of life and fatigue: the al-Ándalus project.	Cross-sectional	N=450 FM	Mode of commuting to local destinations (i.e. local shops, supermarket and local services), fibromyalgia severity, HRQoL, depressive symptoms, sleep quality, pain-related outcomes and fatigue.	Self-reported mode of commuting, FIQR, SF-36, BDI-II, PSQI, pressure pain threshold, PCS, CPSS and MFI-S.

ALPHA, Assessing Levels of Physical Activity and fitness; BDI-II, Beck Depression Inventory-second edition; CPSS, Chronic Pain Self-efficacy Scale; FIQR, Revised Fibromyalgia Impact Questionnaire; FM, Fibromyalgia; HRQoL, Health-related quality of life; IPAQ, International Physical Activity Questionnaire; MFI-S, Spanish version of the Multidimensional Fatigue Inventory; MVPA, Moderate-to-Vigorous Physical Activity; PA, Physical Activity; PCS, Pain Catastrophizing Scale; PSQI, Pittsburgh Sleep Quality Index; SF-36, 36-item Short-Form Health Survey; ST, Sedentary Time;

Statistical analysis

The statistical approach undertaken to achieve the aims of the Project I (studies I to IV) of this Doctoral Thesis is presented below and summarized in Table 4 (see page 67). Analyses were made using SPSS version 18.0 for Windows in the studies I and II, and 20.0 for Windows in the study III (SPSS Inc., Chicago, IL). For the study IV, analyses were undertaken using Stata v.13 (StataCorp LP, College Station, Texas, USA). The level of significance was set at $P < 0.05$.

Study I: Reliability of the ALPHA environmental questionnaire and its association with physical activity in female fibromyalgia patients: the al-Ándalus project.

Cronbach's alpha was conducted to assess the internal consistency of each scale of the ALPHA environmental questionnaire and the mode of commuting questionnaire. Coefficients were rated as: >0.9 = excellent, >0.8 = good, >0.7 = acceptable, >0.6 = questionable, >0.5 = poor and <0.5 = unacceptable[203].

Test-retest reliability was assessed by the intra-class correlation coefficient (ICC), the weighted Kappa statistics and the Spearman correlation. The intra-class correlation coefficients were rated as: weak = 0 to 0.25, low = 0.25 to 0.50, moderate = 0.50 to 0.75, and strong > 0.75[204]. The weighted Kappa statistic were rated as: light = 0 to 0.20, correct = 0.21 to 0.40, moderate = 0.41 to 0.60, substantial = 0.61 to 0.80, and almost perfect = 0.81 to 1.00[204]. The Spearman correlations were rated as: 0 to 0.25 indicates no or weak relationship, 0.25 to 0.50 a moderate relationship, 0.50 to 0.75 a moderate to good relationship and > 0.75 a very good relationship and significant P values[204,205]. In addition, the proportion of agreement was calculated to evaluate the proportion of occasions that individuals gave the same answers.

To study the association between both environmental sum scores and items (without including the dichotomous yes/no items), and mode of commuting scales and items with PA (both IPAQ and accelerometry), the bivariate Pearson's correlations were conducted. Moreover, we repeated these analyses adjusting for the availability and maintenance of cycling path, sidewalk and both infrastructure together.

Study II: Associations between patterns of active commuting and socioeconomic factors in women with fibromyalgia: the al-Ándalus project.

Descriptive characteristics were summarized as means ± standard deviation for continuous variables and as frequencies and percentage for categorical variables. Additionally, in order to identify possible cofounders, we performed Student's t test for Independent Samples to test the differences between fibromyalgia and controls in age, body fat percentage, tender points, fatigue and fibromyalgia impact. We followed the same procedure using Chi-square for categorical variables (i.e. years since clinical diagnosis, civil status, accompaniment at home, living with, educational level, current occupational status, professional status, active commuters, active worker commuters, modes of commuting to local shops, supermarket, local services and work).

Chi-square was performed to compare the differences between fibromyalgia and control groups regarding the mode of commuting. Since we observed an age-effect on this association, the analysis were conducted separately in two age groups using the cut-off point of 51 years old (which is the middle age between the lower (i.e. 37y) and the older (i.e. 65y) age of the participants). The two groups were: <51 (those younger than 51 years old) and ≥51 (those similar or older than 51 years old). Associations between active commuting and socioeconomic factors were assessed using binary logistic regression. The socioeconomic factors were included as dependent variables in

separate models, the active commuting variable was included as fixed factor and the variables of age, body fat percentage, tender points, fatigue and years since clinical diagnosis were included as confounders. An exploratory analysis of the associations between active commuting and socioeconomic factors in the control group was performed using binary logistic regression to observe whether both fibromyalgia and control groups displayed similar associations.

Study III: Is active commuting associated with sedentary behaviour and physical activity in women with fibromyalgia? The al-Ándalus project.

Since previous results in the study II revealed that age modified the relationship between active and passive commuting, the analyses were conducted separately in two age groups, that are <51 (younger group) and ≥51 (older group). To test differences between the younger and older group, we performed analysis of variance (ANOVA) for continuous variables (i.e. age, pressure pain threshold, body fat percentage and objectively measured sedentary time and PA variables) and chi-square for categorical variables (i.e. active commuting, modes of commuting to local shops, supermarket and local services).

One way analysis of covariance (ANCOVA) was performed to test differences between active and passive commuting. Objectively-measured PA and sedentary time variables were included as dependent variables in separate models; the active commuting variable was included as independent variable and age, pressure pain threshold and accelerometry wear time were included as confounders. Linear regression analyses were conducted to further examine the relationships between commuting and PA (outcomes) in separates models, using the enter method. Age, pressure pain threshold and accelerometry wear time were used as confounders. Since socioeconomic variables such as accompaniment at home, educational level and current occupational status were correlated with age (all, $r \leq -0.148$; $p<0.001$), only age was introduced in the models as a confounder.

Study IV: Active commuting is associated with impact of fibromyalgia, health related quality of life and fatigue: the al-Ándalus project.

Since previous results in the study II revealed that age modifies the mode of commuting (active vs. passive), the analyses were conducted separately in two age groups (<51 or younger group and ≥51 or older group). To test differences in symptoms between the younger and older group, we performed Student T-test for continuous variables (i.e. age, body fat percentage, fibromyalgia severity, HRQoL, depressive symptoms, sleep quality, pain-related outcomes, and fatigue variables) and chi-square for categorical variables (i.e. socioeconomic factors, active commuting and modes of commuting to local shops, supermarket and local services).

Linear regression analyses were performed (for the different age groups) to test differences in symptoms between active and passive commuting. Among the fibromyalgia-related symptoms that showed differences across mode of commuting, we created a 4-category variable combining age group and mode of commuting (i.e. where 0= younger and active commuters; 1= younger and passive commuters; 2= older and active commuters; and 3= older and passive commuter). One way analysis of covariance with Bonferroni's correction for multiple comparisons was conducted to assess the differences in each symptom (dependent variables) across groups of age combined with mode of commuting (independent variable). Age was used as confounder for all analyses.

Table 4. Summary table of the statistical approach used in each study of the Project I: Active commuting in women with fibromyalgia - The al-Ándalus project.

Study	Software	Statistical analysis
I. Reliability of the ALPHA environmental questionnaire and its association with physical activity in female fibromyalgia patients: the al-Ándalus project.	SPSS 18.0	Reliability aim: Internal consistency of ALPHA was analysed with Cronbach's alpha; and test retest reliability was analysed with ICC, weighted Kappa, Spearman correlation and proportion of agreement. Association among PA with both environment and mode of commuting aims: bivariate Pearson's correlations (analyses were repeated adjusting for the availability and maintenance of cycling path, sidewalk and both infrastructure together).
II. Associations between patterns of active commuting and socioeconomic factors in women with fibromyalgia: the al-Ándalus project.	SPSS 18.0	Aim (i): Chi-square Aim (ii): Binary logistic regression with socioeconomic factors as DV (separate models) and active commuting as fixed factor. Confounders: age, body fat percentage, tender points, fatigue and years since clinical diagnosis.
III. Is active commuting associated with sedentary behaviour and physical activity in women with fibromyalgia? The al-Ándalus project.	SPSS 20.0	Main aim: ANCOVA between ST and PA with mode of commuting; and LR with PA and ST as DV (separate models) and active commuting as IV. Confounders: age, pressure pain threshold and accelerometry wear time.
IV. Active commuting is associated with impact of fibromyalgia, health related quality of life and fatigue: the al-Ándalus project.	Stata v.13	Aim (i): LR with symptoms variables as DV (separate models) and active commuting as IV. Confounder: age. Aim (ii): ANCOVA between symptoms variables and mode of commuting. Confounder: age.

ALPHA, Assessing Levels of Physical Activity and fitness; ANCOVA, One Way Analysis of Covariance; DV, Dependent Variable; ICC, Intra-Class Correlation; IV, Independent Variable; LR, Linear Regression; PA, Physical Activity; SPSS, Statistical Package for the Social Sciences; ST, Sedentary Time.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

The studies which comprised the Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole), were carried out with different methodologies due to they were part of different research projects: the PACO project (Studies V, VII and VIII), the UP&DOWN Study (Study VI) and the policy project of the Environment Provincial Council of Granada (Study IX). Therefore, for a better understanding of each study, the methodology (i.e. design and participants, protocol and variables) of each one is presented separately (except for studies VII and VIII which were carried out with the same methodology). The different studies are summarized in Table 5.

The ethical approval were needed for studies VI to IX; the methodological characteristics of the study V (i.e. review) did not need this requirement. The study VI followed the ethical standards recognized by the Declaration of Helsinki and the study protocols were approved by the Ethics Committee of the Hospital Puerta de Hierro (Madrid, Spain), the Bioethics Committee of the CSIC, and the Ethics Committe for Research Involving Human Subjects at University of Cádiz. The study was explained to the participants before starting, and parents or tutors signed an informed consent. The studies VII to IX followed the Medical Ethics Committee of Hospital Virgen de las Nieves (Granada, Spain) approved the study design, study protocols and informed consent procedure (case no. 817). Every school involved in those studies were informed about the study purpose, and each school performed

the required process to inform the students and parents and to obtain their acceptance and written consent. Moreover, for the study IX, schools that participated in it were involved in a policy project of the Environment Provincial Council of Granada. The main aim of this project was to encourage safe and healthy routes to school. All headmasters of each school were informed about the purpose of the policy project.

Study V: Assessing modes and frequency of commuting to school in youngsters: a systematic review.

Design: Search Strategy

We searched PubMed, SportDiscus, ProQuest, National Transportation Library and Web of Knowledge through August 2013. Four categories of search terms were identified: self-report, active commuting, school-aged children, and school. Specific terms used in the search were obtained from previous active commuting to school review studies[144,206], from the subject headings (MeSH list) within PubMed, and from the librarians' and researchers´ expertise, and then adapted for each database (see Annexe 11 for more detail). The searching strategy was: [("Question*" OR "Survey" OR "Self-Reported") and ("Travel" OR "Commuting" OR "Commute*" OR "Walkability" OR "Active transportation") and ("child*" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils") and ("*school*" [Title/Abstract])]. In addition to these online databases, we also reviewed our own archives of published documents. All publications in English up to August 2013 were included.

Selection and Review Process

Once potentially relevant studies were identified, their titles and abstracts were reviewed by a member of the study team to determine whether they met the following inclusion criteria: a) focus on children and adolescents aged 4–18.5 years; b) assess active commuting to school using a self-reported measure; c) published in a peer-reviewed journal; d) written in English. We then went on to extract the following data from the studies: general characteristics of the study (i.e., authors, country and city, sample size, gender and age) and specific characteristics of the commuting to school self-report measure (See Figure 1).

Any information lacking in the studies was requested from the authors by e-mail. The data extracted from a random selection of half of the studies was independently audited by two researchers of the study team to resolve any differences of opinion. Any disagreements were resolved through discussion among the research team.

1. Commuting to School Question
2. Commuting to School Responses
3. Trip direction
4. Outcome
5. Recall Period
6. Type of Administration
7. Reliability
8. Validity

Figure 2. Characteristics of the Commuting to School Self-Report Measure

Quality Assessment of the Question

The quality assessment of the question was done on the basis of a standardized assessment list[207]. The list included eight items according to the previously mentioned characteristics of the commuting to school question. Each item was rated as "1" (it was reported) or "0" (it was not reported; see Table 20 in page 102). A total quality score for each study was calculated as the sum of all the items. Studies were defined as low quality if their total score was four or lower; a score between 5 and 6 was defined as medium quality; and 7 or 8 were rated as high quality. The internal validity of the quality score was addressed by two researchers reviewing a random selection of half the studies to resolve any differences of opinion.

Study VI: Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.

Design and participants

Participants belonged to a multi-center longitudinal study named UP&DOWN[208]. A total of 600 Spanish young people aged 7 to 19 years (265 children aged 7 to 11 years and 335 adolescents aged 12 to 19 years) from 7 primary schools in Cádiz and 6 secondary schools in Madrid were initially included.

Regarding inclusion criteria, participants who walk or use passive modes of commuting as their usual mode of commuting were included. Additionally, those participants who report a mean equal or less than 100 minutes traveling to school were included and those who recorded 5 days of objective PA with a minimum of seventy minutes registration per day were included. Only participants who wore GT3X and GT3X+ accelerometer models provided data on step counts and were included in the analysis. Finally, only participants who reported walking as the only mode of commuting to and from school during the whole week were included in the comparison of self-reported vs. objective journey times.

Protocol

All participants completed the Mode and Frequency of Commuting to and from School Questionnaire and wore an accelerometer during the same full school-week (5 days) which the questionnaire asked to, between March 2012 and January 2013. Commuting distance and time from home to school for each participant was estimated as the shortest walking network path between the home and school using Google Maps™ software.

The Mode and Frequency of Commuting to and from School Questionnaire

The tool to assess the mode and frequency of commuting to and from school was a self-reported questionnaire suggested in the study V. We used the Spanish version of this questionnaire (see Annexe 12). Researchers implemented the questionnaire in the classroom and participants completed it. There were four questions: a) the usual mode of commuting to school, b) the usual mode of commuting from school, c) the weekly counts of school trips by mode of commuting to school and d) the weekly counts of school trips by mode of commuting from school. Each question provided these answers: walk, cycle, car, motorcycle, bus or other (in this case, the mode was required). If a participant reported two or more modes of commuting to or from school, the time taken in each mode was required. If the time taken was not reported, the questionnaire of that participant was considered as uncompleted.

A binary variable was obtained from the questions about usual mode of commuting to and from school, which was only used for descriptive data. The use of car, motorcycle or bus were categorized as passive, and walking as walk. Those who were passive on both ways to and from school were categorized as passive participants; those who walked on at least one way (to or from school) were categorized as walk participants. A similar binary variable was obtained from the questions about every single journey in the week to and from school, which was used for the validation analyses. The use of car, motorcycle or bus were categorized as passive, and walking as walk. Active journeys per week was calculated summing the number of walking travels on the way to and from school in the overall week (0 to 10 travels)

The time from home to school and from school to home were reported for each participant in the questionnaire. They wrote the time (i.e. hours and minutes) when they left home and arrived at school in the morning, and the time

when they left school and arrived home in the afternoon or evening. The duration of each journey was calculated in minutes.

Physical Activity

The Actigraph accelerometer models GT1M, GT3X and GT3X+ (ActiGraph, Pensacola, FL, USA) were used to measure sedentary time, PA levels and steps. Data were collected with the low-frequency extension filter disabled at a sampling frequency of 30 Hz and subsequently collapsed to 2-second epochs. Participants wore them at the lower back attached to an elastic belt. Data from ActiGraph accelerometers were downloaded and processed using the ActiLife software v6.5.3 (ActiGraph, Pensacola, FL, USA).

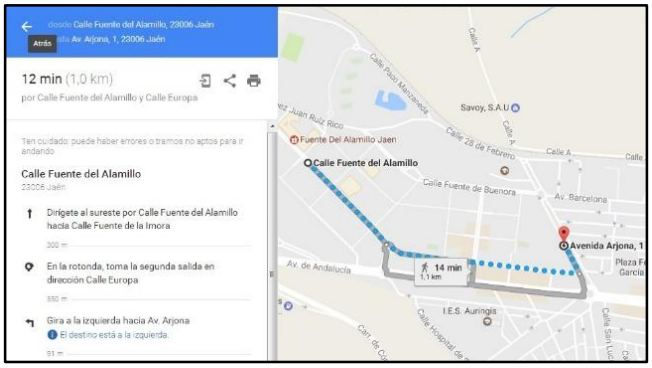
Non-wear periods were identified applying the algorithm developed by Troiano et al.[209] to the vector magnitude (i.e. strings of 0 counts per minute during a minimum of 60 min with an allowance of 2 minutes with 0-100 counts per minute were classified as non-wear periods and excluded from the analyses). To be included in the analyses, a registration of a minimum of 70 minutes for each school day (a total of 5) was required. From the full day data, only recordings of accelerometry during the time of the commuting to and from school were studied (i.e. 30 minutes before the school starting time and 30 minutes after the school exit time regarding each school timetable).

Sedentary time and PA levels, during the time of the commuting to and from school, were set as the time (minutes/journey) engaged in sedentary, light, moderate, vigorous and MVPA based upon standardized cut-offs of 0–100, 101–2292, 2293-4008, ≥4009 and ≥2293 counts per minute, respectively[210]. Total step counts were also registered.

Finally, since the steps and the PA intensity variables of light, moderate, vigorous and moderate to vigorous were not displayed normal distributions, log base 10-transformations were performed and these variables with normal distributions were used in the analyses.

Objectively measured distance and time from home to school

The objective measure of the commuting distance from home to school for each participant was estimated using Google Maps™ software (last updated March 1st, 2014). Distances were calculated selecting the shortest walking route from the family postal address to the school postal address, from each participant. Objective time needed to the journey, was reported by Google Maps™ based on the time needed for each participant to cover the shortest walking route from home to school.



Picture 6. Screenshot of Google Maps distance and time estimation.
(Source: Google Maps™)

Study VII: Mode of commuting TO and FROM school: a similar or different pattern?
Study VIII: Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.

Design and participants

Longitudinal data collection was carried out during the 2012-2013 school year and included 3 measurement time points: autumn (November 19th to 23rd and 26th to 30th), winter (February 11th to 15th, 18th to 22nd and March 4th to 8th) and spring (May 13th to 17th and 20th to 24th). Participants were assessed over one week in each season

Students who participate in studies VII and VIII come from 39 schools (10 primary schools, 27 secondary schools and 2 primary-secondary schools; 92% public schools and 8% private schools) located in 22 cities within 3 provinces from the southern of Spain (Almería, Granada and Murcia). In the study VII, only participants who took part at the first measurement point in autumn were considered. Therefore, a total of 6,004 students from 7 to 20 years old participated in the study VII. There were 1,292 children (49% males) aged from 7 to 11 years (mean age of 10.0 ± 1.2) and 4,712 adolescents (51% males) from 12 to 20 years (mean age of 14.3 ± 1.4). On the other hand, participants who took part in the three measurement points were considered for the study VIII. A total of 1,409 children (49% males) aged 7 to 11 and 5,570 adolescents (51% males) aged 12 to 21 years participated in the study.

The inclusion criterion for the study VII was to have complete data on the mode of commuting to and from school questionnaire. For the study VIII, participants were included in the analysis if all personal data (i.e. age, gender, address) were reported. All individual journeys for included participants were then included as long as a single travel mode had been reported. Multimodal trips were excluded as they could not be categorised as active or passive.

Protocol

Those who consented to participate were asked to complete the 'Mode and Frequency of Commuting to and from School Questionnaire' at the 3 measurement time points. Weather data from the nearest weather station to each school were obtained from the Spanish Meteorological State Agency (AEMET). Commuting distance from home to school for each participant was estimated as the shortest walking network path between the home and school using Google Maps™ software.

Commuting to and from school

Students completed a self-reported questionnaire with the help of the teacher; the use of such surveys has been proposed in the study V as the most appropriate method for ascertaining mode of commuting to school. In addition to personal data (date of birth, gender, postal address, school and grade) the questionnaire asked participants how they usually travelled to and from school, and also to record how they had travelled to and from school on every day over the previous week. The response options were: walk, cycle, motorcycle, car, bus and 'other' (in this case, the mode was requested). From these answers modes were classed as active transport (walk and cycle) and passive transport (car, motorcycle and bus). The mode "other" was omitted as few journeys (n=130) recorded an alternative mode. Journeys in which participants selected at least one active mode and one passive mode were also omitted as it was not possible to class them as either active or passive transport (n=90 journey observations).

Two variables measuring usual mode of commuting to school and usual mode of commuting from school were created by the sum of the usual mode of commuting questions at each season (autumn, winter and spring). Those participants were coded as being usually active if they reported a usually active mode of commuting (walk or cycle) in at least half of the measurement time points they completed. Otherwise they were coded as being usually passive.

Weather variables

Weather data for each week of questionnaire measurements were requested for the nearest weather station to each school from the Spanish Meteorological State Agency. Day length, direct sunlight (hours of sunlight with an intensity ≥80%), temperature, wind speed and precipitation data were reported by Spanish

Meteorological State Agency for each hour of the day. Variables were calculated describing total of hours per day of daylight and direct sunlight, for school hours including commuting time (07:00 to 15:00) means of temperature and wind speed, and total precipitation.

Study IX: Active commuting to school: a daily opportunity to improve children's independent mobility.

Design and participants

This cross-sectional study was carried out during the scholar year 2011/2012. A total of 745 Primary school children (6-12 years old) from four public schools of the Granada region (Spain) were invited by convenience to participate in the study. The definition and meaning of rural and urban residence varies across geographical areas, depending on national standards[211]. In this study, all school are located in rural areas (i.e. areas with less than 20.000 inhabitants) which have a similar structures of small urban catchment area.

To be included in the study, participants had to report complete data on the questionnaire about personal, accompaniment mode, safety perception and mode of commuting to school data; and not to select as mode of commuting a "multimodal" option (i.e. select more than one response option) due to the difficulty to characterise the mode of commuting as active or passive.

Protocol

All participants who accepted to collaborate were asked to complete a questionnaire during school time, with the help of the teacher and the research team. Children were asked about personal data, school grade, accompaniment mode, safety perception and the mode of commuting to school.

Personal data

Children were asked to report personal data (i.e. age and gender) and school grade (response option: 1st, 2nd, 3rd, 4th, 5th and 6th grades). School grade was recoded in three age groups as young children (i.e. 1st and 2nd grade which includes ages from 6 to 7), middle children (i.e. 3rd and 4th grade which includes ages from 8 to 9) and old children (i.e. 5th and 6th grades which includes ages from 10 to 12).

Picture 7. Children commuting accompanied to school by an adult.
(Source: Manuel Herrador-Colmenero)

Accompaniment mode

The accompaniment mode on the journey from home to school were asked. The response options were alone, friends, brothers/sisters, parents, grandparents, adult neighbour and child-minder. The accompaniment on the journey from home to school was recoded in a multinomial variable as alone (i.e. alone), other children (i.e. friends and brothers/sisters) and adults (i.e. parents, grandparents, adult neighbour and child-minder); and in a binary variable as independent (i.e. alone, friends and brothers/sisters) and adults (i.e. parents, grandparents, adult neighbour and child-minder).

Safety perception

The question "Do you think that travel unaccompanied to school is safe?" was used to assess the safety perception. The response options were safe and unsafe.

Mode of commuting

The mode of commuting to school was assessed with the question "How do you go to school each day?" The response options were walking, cycling, by car, by bus and by motorcycle. The mode of commuting to school was recoded as active (i.e. walking and cycling) and passive (i.e. by car, by bus and by motorcycle).

Table 5. Summary table of the methods used in the Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole).

Project	Study	Design	Sample	Main variables	Methods
The PACO project	V. Assessing modes and frequency of commuting to school in youngsters: a systematic review.	Systematic review	N=158 studies	Commuting to school question, commuting to school responses, trip direction, outcome, recall period, type of administration, reliability and validity.	A search strategy with four categories of search terms were identified: self-report, active commuting, school-aged children, and school.
The UP & DOWN project	VI. Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.	Cross-sectional	N=192 children N=197 adolescents	Usual mode of commuting to and from school, daily mode of commuting to and from school in the last week, distance and time between home and school, ST, PA levels (i.e. light, lifestyle, moderate, MVPA, total PA) and steps objectively measured.	Mode and Frequency of Commuting to and from School Questionnaire, Google Maps™ and accelerometry.
The PACO project	VII. Mode of commuting TO and FROM school: a similar or different pattern?	Cross-sectional	N=1279 children N=4681 adolescents	Usual mode of commuting to and from school and daily mode of commuting to and from school in the last week.	Mode and Frequency of Commuting to and from School Questionnaire
The PACO project	VIII. Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.	Cross-sectional	N= 163846 journey observations	Usual mode of commuting to and from school, daily mode of commuting to and from school in the last week, direct sunlight, temperature, wind speed, precipitation and season.	Mode and Frequency of Commuting to and from School Questionnaire and weather variables.
Provincial Council of Granada project	IX. Active commuting to school: a daily opportunity to improve children's independent mobility.	Cross-sectional	N=652 children	Usual mode of commuting to school, accompaniment mode and safety perception.	Self-reported questionnaire about commuting to school and correlates.

MVPA, Moderate-to-Vigorous Physical Activity; PA, Physical Activity; ST, Sedentary Time.

Statistical analysis

The statistical approach undertaken to achieve the aims of the Project II (studies VI to IX) of this Doctoral Thesis is presented bellow and summarized in Table 6 (see page 77). The nature of the design of the study V makes no necessary the use of statistical procedures. Analyses were made using SPSS version 18.0 for Windows in the study VI, and 22.0 for Windows in the study IX (SPSS Inc., Chicago, IL). For the study VII, analyses were performed using R software, version 3.0.2 for x86_64-pc-linux-gnu (64-bit), while for the study VIII, analyses were undertaken using Stata v.11 (StataCorp LP, College Station, Texas, USA) and MLwiN v.2.34. The level of significance was set at $P < 0.05$.

Study VI: Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.

Descriptive data are presented as mean ± standard deviation in quantitative variables and percentage in qualitative variables. One-way analysis of variance for normal quantitative variables (i.e., years and PA), Mann-Whitney U-test for non-normal quantitative variables (i.e., active travel per week, objective distance and time to school and self-reported time to school) and Chi-square test for qualitative variables (i.e., gender, mode of commuting to and from school) were performed to analyse the differences between passive and walk participants in their way to and from school.

Associations between the steps, sedentary time and PA levels (i.e. light and MVPA) with mode of commuting (i.e. passive and walk participants) were studied using ANCOVA controlling by distance from home to school for each journey (i.e., go to school and go back from school for every week day from Monday to Friday). Previously, interactions between gender and age were studied in these analyses. In children, there were not interactions and the children sample was studied not being controlled by age. In adolescents, there were interactions for age and, consequently the age was included as a confounder.

The agreement of the objective time and self-reported time from home to school scores was plotted using Bland-Altman analyses[212], with the difference between the two measurements plotted against the mean of the two measurements. Limits of agreement were calculated as the mean difference ±1.96 standard deviations. One sample Student T-tests were conducted for the mean of differences between objective and self-report time for both children and adolescents.

Study VII: Mode of commuting TO and FROM school: a similar or different pattern?

Descriptive analysis was undertaken to study the differences between the modes of commuting from home to school and from school to home, and they were summarized as percentages. McNemar test was performed for each usual mode of commuting in order to test if there were differences between the proportion of students that used a specific mode of commuting to school and from school. Since very few participants cycled or motorcycled to school, these modes were excluded from the analyses.

Descriptive statistics (percentages, mean ± standard deviation) were calculated to analyse the differences between the usual mode of commuting and the number of daily journeys in the last week using that mode of commuting (i.e. number of days per week for each usual mode of commuting). For example, for those students that marked walking as the usual mode of commuting to school, the distribution and mean for number of days walked in the last week were assessed. These analyses were undertaken for each mode of commuting to school, from school and total (regarding the 10 journeys of the week only for those participants who reported the same mode of commuting to go and to come back from school). All the

analyses were performed separately for children and adolescents.

Study VIII: Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.

Descriptive analysis was undertaken in order to characterise participants and journey observations, summarised as mean and standard deviation for continuous variables, and percentages for categorical variables. Students t-tests were performed for continuous variables and Chi-square analyses were performed for categorical variables to test if there were differences in outcomes between seasons (i.e. autumn, winter and spring) and between the modes of commuting reported in each journey (i.e. active transport and passive transport).

As the sampling frame of journey observations was based on participants and schools, adjusted relationships between weather variables and each mode of commuting outcome were assessed using logistic multilevel modelling, using the binary mode of commuting mode as the outcome (active vs. passive) and Markov Chain Monte Carlo (MCMC) estimation. The hieratical nature of the sample of journeys within participants within schools, is taken into account in the model. First, the association between each exposure variable and each outcome measure was assessed. Individual factors with a p-value of <0.1 were included in multiple models. Due to the strong relationship between season and day length, we included only season in subsequent analyses. For the primary aim, multilevel logistic regression models were fitted stratified by direction of travel (to vs. from school), and age (children vs. adolescents). To achieve the secondary aims, multilevel logistic regression models were undertaken stratified by the usual mode of commuting to school (i.e. usually active and usually passive), and age (children vs. adolescents).

Study IX: Active commuting to school: a daily opportunity to improve children's independent mobility.

Descriptive statistics clustered by age groups were summarised for continuous variables (i.e. age) as means ± standard deviation, and for categorical variables (i.e. gender, accompaniment mode, safety perception and mode of commuting to school) as percentage. Moreover, Student t test for Independent Samples analysis was performed for the continuous variable and Chi-square analyses were performed for categorical variables to test differences between age groups.

In order to test the differences of accompaniment mode between children from different age groups who commute to school actively, Chi-square analyses were performed.

Finally, association between safety perception and accompaniment mode in children who commute to school actively were assessed using logistic regression. The accompaniment binary variable was included as dependent variable in separate models for each age groups, and safety was included as fixed factor. Age and gender were included as cofounders.

Table 6. Summary table of the statistical approach used in each study of the Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole).

Study	Software	Statistical analysis
V. Assessing modes and frequency of commuting to school in youngsters: a systematic review.	----	----
VI. Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.	SPSS 18.0	Aim (i): ANCOVA with steps, ST and PA as DV (separate models), and active commuting as IV. Confounders: distance from home to school and age only in adolescents. Aim (ii): Agreement with Bland-Altman plots for objective and self-reported time from home to school. Student t-tests for the mean of differences between objective and self-report time.
VII. Mode of commuting TO and FROM school: a similar or different pattern?	R, v.3.0.2	Aim (i): McNemar test in each usual mode of commuting to test if there were differences between the proportion of students that used a specific mode of commuting to school and from school. Aim (ii): Percentages, mean ± SD between the usual mode of commuting and the number of daily journeys in the last week
VIII. Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.	Stata v.11, MLwiN v.2.34	Logistic multilevel modelling (with MCMC) with mode of commuting as DV and weather variables as IV. Aim (i) the analysis were stratified by travel direction and age. Aim (ii) the analysis were stratified by usual mode of commuting and age
IX. Active commuting to school: a daily opportunity to improve children's independent mobility.	SPSS 22.0	Aim (i): Chi-square for accompaniment mode and mode of commuting for each age group separately. Aim (ii): only in children who commute to school actively, LR with accompaniment mode as DV and safety perception as IV, conducted separately for each age group. Confounders: age and gender.

ANCOVA, One Way Analysis of Covariance; DV, Dependent Variable; IV, Independent Variable; LR, Linear Regression; MCMC, Markov Chain Monte Carlo; PA, Physical Activity; SD, Standard Deviation; SPSS, Statistical Package for the Social Sciences; ST, Sedentary Time.

RESULTS

Muse
Absolution (2003)
Butterflies and Hurricanes

RESULTS

The results of each individual study comprising the present Doctoral Thesis are presented below.

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV).

Study I: Reliability of the ALPHA environmental questionnaire and its association with physical activity in female fibromyalgia patients: the al-Ándalus project.

Table 7 shows demographic and clinical variables of the patients, and Table 8 shows the sample size, minimum and maximum, median, 25 and 75 percentile, mean, standard deviation and Cronbach's alpha of each scale and items of the ALPHA questionnaire. Internal consistency was low overall (Cronbach's $\alpha \leq 0.82$), ranging from 0.14 (workplace or study environment) to 0.82 (availability of infrastructure and availability of sidewalks). The values for the other scales were 0.37 for connectivity and home environment, 0.56 for aesthetics, 0.62 for cycling and walking network, 0.65 for safety from traffic and pleasantness, 0.73 for maintenance, 0.71 for safety from crime, 0.78 for total safety, 0.79 for distance to local facilities and 0.81 for availability on bike lanes.

Reliability of the ALPHA questionnaire

Table 9 shows the test-retest reliability of scales/items of the ALPHA questionnaire. The ICC analysis showed low-to-strong test–retest reliability in the scales ranging from 0.34 (in pleasantness) to 0.80 (home environment); 73.3% of the scales (n = 11) were above 0.50, indicating moderate to strong reliability. The ICC of the individual items ranged from 0.14 (in employer subsidised public transport/cycling) to 0.94 (escalators); 70.21% of the items (n = 33) were above 0.50, indicating moderate to strong reliability.

Table 7. Demographic and clinical variables of the participants in Study I.

Variable	N	
Age, mean (SD)	109	51.1(9.3)
Total number points, mean (SD)	109	17.32(1.6)
Total algometer score, mean (SD)	109	27.69(2.2)
Total algometer score average, mean (SD)	109	1.54(0.1)
Years since clinical diagnosis, n (%)	109	
≤ 5 years		45(41.3)
> 5 years		64(58.7)
Marital status, n (%)	109	
Married		83(76.1)
Single		15(13.8)
Divorced		8(7.3)
Widowed		3(2.8)
Educational status, n (%)	108	
Unfinished studies		5(4.6)
Primary school		44(40.7)
Professional training		19(17.6)
Secondary school		14(13.0)
University medium degree		10(9.3)
University higher degree		16(14.8)
Occupational status, n (%)	83	
Employment		32(38.6)
Unemployment		22(26.5)
Retired /Pensioner		29(34.9)
Physical activity: IPAQ (total week min·day^{-1}), mean (SD)		
Total PA	99	5665.46(6399.0)
Total MPA	107	3197.78(3656.8)
Total VPA	108	681.48(2760.5)
Total walking	100	2170.74(2877.8)
Transport: total	100	1208.13(1898.4)
Transport: walking	100	1208.13(1898.4)
Transport: cycling	108	25.00(259.8)
Transport: walking to work	106	302.29(1321.7)
Leisure time: total PA	100	1112.40(1838.9)
Leisure time: MPA	108	217.22(810.2)
Leisure time: VPA	108	188.89(1152.2)
Leisure time: walking	100	765.60(1250.5)
Domestic	107	2476.84(2663.9)
Physical activity: accelerometry (total week min/day), mean (SD)		
Sedentary	93	591.65(125.72)
Light	93	115.76(24.49)
Lifestyle	93	64.66(19.51)
Moderate	93	50.08(26.31)
MVPA	93	51.40(27.24)
Total PA (total week cpm)	93	218.29(84.49)

IPAQ, International Physical Activity Questionnaire; MPA, moderate intensity physical activity; MVPA, moderate to vigorous intensity physical activity; PA, physical activity; SD, standard deviation; VPA, vigorous intensity physical activity.

Table 8. Descriptive items (sample size, minimum, maximum, median, percentile 25 - 75, mean, standard deviation) and internal consistency (Cronbach's alpha) from test in ALPHA environmental questionnaire and mode of commuting questionnaires.

Scale/Item	N	Minimum/ maximum	Median (P25,P75)	Mean (SD)	Cronbach's alpha
Density score (sum score of item a + (12*item b) + (50*item c))	90	67-299	208 (111.0, 263.0)	192.1 (73.3)	n.a.
a) Detached houses	96	1-5	1 (1.0, 2.8)	1.9 (1.5)	
b) Semi-detached townhouses	98	1-5	2 (1.0, 4.0)	2.5 (1.6)	
c) Apartment buildings or blocks of flats	99	1-5	3 (1.0, 5.0)	3.2 (1.7)	
Distance to local facilities (sum score of items a to h)	90	7-31	16 (13.0, 21.0)	17.4 (5.8)	0.79
a) Local shop	106	1-5	2 (1.0, 3.0)	2.3 (1.2)	
b) Supermarket	105	1-5	2 (2.0, 3.0)	2.6 (1.2)	
c) Local service	105	1-5	2 (2.0, 3.0)	2.7 (1.1)	
d) Restaurant, cafe, bar or pub	99	1-5	2 (1.0, 3.0)	2.2 (1.1)	
e) Bus stop	105	1-4	1 (1.0, 2.0)	1.7 (0.8)	
f) Sport and leisure facility	101	1-5	3 (2.0, 4.0)	3.3 (1.3)	
g) Open recreation area	99	1-5	2 (1.0, 5.0)	2.9 (1.7)	
Availability of infrastructure (sum score of items a to d)	91	4-16	8 (6.0, 12.0)	8.8 (3.4)	0.82
Availability of sidewalks (sum score of items a, b)	91	2-8	3 (2.0, 5.0)	3.9 (1.9)	0.82
Availability of bike lanes (sum score of items c, d)	97	2-8	5 (3.5, 7.0)	5.1 (2.0)	0.81
a) Special lanes, routes or paths	102	1-4	2.50 (2.0, 4.0)	2.6 (1.1)	
b) Traffic-free cycle routes	101	1-4	2 (2.0, 3.0)	2.5 (1.1)	
c) Sidewalks	98	1-4	2 (1.0, 4.0)	2.1 (1.1)	
d) Pedestrian zones	91	1-4	2 (1.0, 3.0)	1.9 (1.0)	
Maintenance (sum score of items a to c)	79	3-12	6 (4.0, 8.0)	6.1 (2.4)	0.73
a) Cycling paths are well maintained	105	1-4	2 (1.0, 2.0)	2.0 (1.1)	
b) Sidewalks are well maintained	79	1-4	2 (1.0, 4.0)	2.3 (1.2)	
c) Open spaces are well maintained	105	1-4	2 (1.0, 2.0)	1.8 (0.9)	
Total safety (sum score of reversed items a to f)	90	6-24	20 (17.0, 23.0)	19.3 (3.9)	0.78
Safety from crime (sum score of reversed items a, e, f)	97	3-12	10 (9.0, 12.0)	9.8 (2.1)	0.71
Safety from traffic (sum score of reversed items b, c, d)	92	3-12	10 (8.0, 11.0)	9.4 (2.3)	0.65
a) Dangerous to leave a bicycle locked	99	1-4	3 (2.0, 4.0)	2.8 (1.1)	
b) Not enough safe place to cross busy streets	104	1-4	3 (2.3, 4.0)	3.1 (1.0)	
c) Walking is dangerous because of the traffic	103	1-4	4 (3.0, 4.0)	3.4 (0.8)	
d) Cycling is dangerous because of the traffic	93	1-4	3 (2.0, 4.0)	2.8 (1.1)	
e) Dangerous during the day because of the level of crime	104	1-4	4 (4.0, 4.0)	3.7 (0.7)	
f) Dangerous during the night because of the level of crime	104	1-4	4 (3.0, 4.0)	3.4 (0.9)	
Pleasantness (sum score of items a to d)	105	6-15	10 (9.0, 11.0)	9.9 (1.8)	0.65
Aesthetics (sum score of b, c, d)	105	3-12	7 (6.0, 8.0)	6.9 (1.7)	0.56
a) A pleasant environment for walking or cycling	105	1-4	3 (2.0, 4.0)	3.0 (1.0)	
b) Generally free from litter or graffiti	105	1-4	3 (2.0, 4.0)	3.0 (1.0)	
c) Trees along the streets	105	1-4	3 (2.0, 4.0)	2.9 (1.0)	
d) A lot of badly maintained, unoccupied or ugly buildings	106	1-4	3 (2.0, 4.0)	3.0 (1.2)	
Cycling and walking network (sum score of items a to d)	101	5-16	12 (10.0, 14.0)	12.0 (2.8)	0.62
Connectivity (sum score of items a, c, d)	102	4-12	9 (7.8, 11.0)	9.0 (2.0)	0.37
a) Many shortcuts for walking	104	1-4	3 (2.0, 4.0)	2.8 (1.1)	
b) Cycling is quicker than driving during the day	105	1-4	3 (2.0, 4.0)	3.0 (1.1)	
c) Many roads junctions	104	1-4	3 (2.0, 4.0)	2.8 (1.0)	
d) Many different routes for walking or cycling from place to place	107	1-4	4 (3.0, 4.0)	3.5 (0.9)	

Home environment (sum score of items a, b, c, d, e, reversed f)	107	0-5	2 (1.0, 3.0)	2.5 (1.4)	0.37
		Yes [n(%)]	No [n(%)]		
a) Dog	107	75 (70.1)	32 (29.9)		
b) Bicycle	107	45 (42.1)	62 (57.9)		
c) Garden	107	24 (22.4)	83 (77.6)		
d) Small sport equipment	107	71 (66.4)	36 (33.6)		
e) Exercise equipment	107	57 (53.3)	50 (46.7)		
f) Car	107	32(29.9)	75(70.1)		
Workplace or study environment (sum score of items b, c, d, e, g, h, i, j, reversed a, f)	31	2-7	3 (2.0;4.0)	3.42 (1.4)	0.14
		Yes [n(%)]	No [n(%)]		
a) Escalators	35	21 (60.0)	14 (40.0)		
b) Stairs	35	25 (71.4)	10 (28.6)		
c) Fitness centre / equipment	35	4(11.4)	31 (88.6)		
d) Bicycle	34	1 (2.9)	33 (97.1)		
e) A safe place to leave a bike	34	15 (44.1)	19 (55.9)		
f) Enough car parking spaces	34	23 (67.7)	11 (32.4)		
g) Showers and changing rooms	35	17 (48.6)	18 (51.4)		
h) Exercise classes	35	7 (20.0)	28 (80.0)		
i) Sport club	34	1 (2.9)	33 (97.1)		
j) Employer subsidized public transport / cycling	35	4(11.4)	31 (88.6)		
Commuting 4 levels (sum score of items a, b, c)	94	0-3	2 (1.0, 3.0)	2.04 (1.1)	0.70
Commuting 5 levels (sum score of items a to d)	29	0-4	2 (0.5, 3.0)	2.03 (1.4)	0.57
a) Mode of travel to local shops	96	1-5	1 (1.0, 1.0)	1.51 (0.9)	
b) Mode of travel to supermarket	105	1-5	1 (1.0, 3.0)	2.01 (1,1)	
c) Mode of travel to local services	103	1-5	1 (1.0, 3.0)	1.59 (1,1)	
d) Mode of travel to study or work	32	1-5	3 (3.0, 3.0)	2.97 (1.2)	

N, sample size; n.a., not applicable; SD, standard deviation.

Weighted kappa of the individual items ranged from 0.14 (employer subsidised public transport/cycling) to 0.93 (escalators); 68.1% of the items (n = 32) were above 0.40, indicating moderate to almost perfect reliability. Spearman's correlations of the scales ranged from 0.31 (in aesthetics) to 0.81 (home environment) (moderate to very good relationship respectively); and individual items ranged from 0.14 (in employer subsidised public transport/cycling) to 0.94 (escalators); 100% of the scales (n = 15) and 95.8% of the items (n = 45) were significant. The proportion of agreement for all individual items ranged between 33.3% (in many shortcuts for walking) and 96.7% (in escalators and sport club).

Comparison of the ALPHA questionnaire with physical activity

Significant correlations existed between scales/items of the ALPHA questionnaire and domains and intensity-specific physical activities measured by the IPAQ (Table 10). The degree of the positive significant correlations was from weak to moderate, ranging from r = 0.19 to r = 0.41. There were negative significant correlations ranging from r = −19 to r = −28. Environmental scores for the ALPHA questionnaire correlated significantly on the whole with the moderate intensity PA-related total, for example, time in minutes (ranging from r = 0.21 to r = 0.24), PA-related transport (both walking, r = 0.22 to r = 0.41, and total, r = 0.22 to r = 0.41) and total PA-related leisure time (r = 0.24 to r = 0.29).

Table 11 shows the significant correlations between scales/items of the ALPHA questionnaire and intensity-specific physical activities measured by accelerometry. The degree of correlation was from weak to moderate, ranging from r = 0.21 to r = 0.43. The environmental scores of availability of infrastructure, availability of sidewalks, availability of bike lanes, cycling and walking

network and connectivity correlated significantly with moderate intensity PA (from r = 0.21 to r = 0.43) and moderate to vigorous intensity PA (r = 0.21 to r = 0.41). The environmental scores of availability of infrastructure and availability of sidewalks correlated significantly with total PA (r = 0.25 and r = 0.22, respectively).

Reliability of the mode of commuting questionnaire

Internal consistency was acceptable in commuting four levels (Cronbach's α = 0.70) and poor in commuting five levels (Cronbach's α = 0.57) and ICC analysis showed strong test–retest reliability, 0.86 and 0.96, respectively (see Table 9). ICC of the individual items was over 0.59 (mode of travel to local services) to 1.00 (mode of travel to study or work) and weighted kappa ranged from 0.68 (mode of travel to local services) to 1.00 (mode of travel to study or work). Spearman's correlation of the scales was 0.84 (commuting four levels) to 0.93 (commuting five levels); and individual items ranged from 0.72 (mode of travel to local services) to 1.00 (mode of travel to study or work); 100% of the scales and items were significant. The proportion of agreement for all individual items ranged between 90.0% (mode of travel to local services) and 100.0% (mode of travel to study or work).

Comparison of the mode of commuting questionnaire with PA

Active commuting correlated significantly ($P \leq 0.05$) with PA measured by both self-reported and objectively measures (Tables 10 and 11, respectively). Active commuting correlated significantly within the IPAQ in walking-related total (r = 0.22) and PA-related transportation (both walking, r = 0.41, and total, r = 0.41). Finally, active commuting correlated within the accelerometry in moderate PA (r = 0.43) and MVPA (r = 0.41). When these analyses were repeated adjusting for multivariate analyses controlling for the availability and maintenance of cycling path, sidewalk and both infrastructure together, non-significant differences were found.

Table 9. Test-retest reliability scores (absolute agreement, ICC), weighted Kappa and Spearman from test in ALPHA environmental questionnaire and mode of commuting questionnaires.

Scale/Item	N	ICC	Weighted Kappa	Spearman (Confidence interval)	Agreement (%)
Density score (sum score of item a + (12*item b) + (50*item c))	85	0.77		0.76** (0.64,0.85)	
a) Detached houses	93	0.50	0.47	0.49**(0.29,0.68)	66.7
b) Semi-detached townhouses	94	0.71	0.65	0.70**(0.53,0.82)	65.9
c) Apartment buildings or blocks of flats	96	0.84	0.73	0.84**(0.75,0.91)	64.6
Distance to local facilities (sum score of items a to h)	82	0.79		0.76**(0.63,0.86)	
a) Local shop	105	0.63	0.54	0.64**(0.49,0.78)	59.1
b) Supermarket	102	0.63	0.50	0.60**(0.43,0.73)	51.0
c) Local service	102	0.80	0.64	0.77**(0.66,0.85)	59.7
d) Restaurant, cafe, bar or pub	93	0.51	0.33	0.50**(0.34,0.65)	35.5
e) Bus stop	104	0.44	0.31	0.45**(0.28,0.59)	50.0
f) Sport and leisure facility	95	0.72	0.61	0.72**(0.57,0.84)	56.8
g) Open recreation area	94	0.65	0.58	0.64**(0.48,0.79)	58.5
Availability of infrastructure (sum score of items a to d)	86	0.76		0.74**(0.61,0.85)	
Availability of sidewalks (sum score of items a, b)	87	0.73		0.68**(0.52,0.78)	
Availability of bike lanes (sum score of items c, d)	94	0.59		0.59**(0.42,0.75)	
a) Special lanes, routes or path	101	0.54	0.44	0.54**(0.36,0.69)	49.6
b) Traffic-free cycle routes	98	0.56	0.46	0.56**(0.40,0.71)	52.0
c) Sidewalks	97	0.63	0.50	0.61**(0.44,0.75)	53.7
d) Pedestrian zones	87	0.70	0.55	0.70**(0.55,0.81)	57.4
Maintenance (sum score of items a to c)	72	0.65		0.61**(0.42,0.75)	
a) Cycling paths are well maintained	104	0.53	0.44	0.52**(0.35,0.66)	57.8
b) Sidewalks are well maintained	73	0.48	0.36	0.46**(0.23,0.64)	42.5
c) Open spaces are well maintained	103	0.42	0.32	0.41**(0.24,0.58)	51.5
Total safety (sum score of reversed items a to f)	85	0.75		0.71**(0.60,0.81)	
Safety from crime (sum score of reversed items a, e, f)	95	0.77		0.75**(0.63,0.84)	
Safety from traffic (sum score of reversed items b, c, d)	86	0.61		0.60**(0.44,0.74)	
a) Dangerous to leave a bicycle locked	97	0.56	0.43	0.56**(0.38,0.70)	46.4
b) Not enough safe place to cross busy streets	103	0.41	0.38	0.41**(0.21,0.58)	55.3
c) Walking is dangerous because of the traffic	100	0.58	0.49	0.61**(0.45,0.75)	67.0
d) Cycling is dangerous because of the traffic	88	0.49	0.39	0.49**(0.31,0.65)	45.5
e) Dangerous during the day because of the level of crime	103	0.56	0.49	0.55**(0.36,0.72)	74.7
f) Dangerous during the night because of the level of crime	103	0.74	0.67	0.75**(0.60,0.86)	76.7
Pleasantness (sum score of items a to d)	103	0.34		0.32**(0.12,0.50)	
Aesthetics (sum score of b, c, d)	104	0.36		0.31**(0.10,0.50)	

a) A pleasant environment for walking or cycling	103	0.28	0.23	0.32**(0.13,0.49)	40.7
b) Generally free from litter or graffiti	104	0.33	0.31	0.34**(0.15,0.53)	46.1
c) Trees along the streets	104	0.35	0.32	0.39**(0.20,0.55)	48.0
d) A lot of badly maintained, unoccupied or ugly buildings	105	0.17	0.18	0.21*(0.00,0.41)	44.8
Cycling and walking network (sum score of items a to d)	92	0.49		0.48**(0.28,0.66)	
Connectivity (sum score of items a, c, d)	94	0.40		0.42**(0.20,0.62)	
a) Many shortcuts for walking	99	0.30	0.20	0.28**(0.09,0.46)	33.3
b) Cycling is quicker than driving during the day	103	0.52	0.44	0.50**(0.31,0.64)	53.3
c) Many roads junctions	99	0.41	0.33	0.41**(0.20,0.60)	44.4
d) Many different routes for walking or cycling from place to place	106	0.41	0.38	0.40**(0.20,0.58)	63.2
Home environment (sum score of items a, b, c, d, e, reversed f)	105	0.80		0.81**(0.72,0.88)	
a) Dog	105	0.73	0.73	0.73**(0.57,0.87)	88.6
b) Bicycle	106	0.92	0.92	0.92**(0.84,0.98)	96.2
c) Garden	106	0.66	0.65	0.66**(0.46,0.82)	87.8
d) Small sport equipment	106	0.54	0.54	0.54**(0.37,0.71)	79.3
e) Exercise equipment	106	0.75	0.75	0.75**(0.63,0.87)	87.8
f) Car	105	0.66	0.64	0.66**(0.50,0.80)	83.0
Workplace or study environment (sum score of items b, c, d, e, g, h, i, j, reversed a, f)	27	0.76		0.66**(0.31,0.89)	
a) Escalators	31	0.94	0.93	0.94**(0.80,1.00)	96.7
b) Stairs	31	0.78	0.77	0.78**(0.49,1.00)	90.3
c) Fitness centre / equipment	31	0.73	0.72	0.75**(0.47,1.00)	93.6
d) Bicycle	30	0.66	0.65	0.70**(0.47,1.00)	96.6
e) A safe place to leave a bike	30	0.55	0.54	0.55**(0.23,0.82)	76.7
f) Enough car parking spaces	30	0.75	0.72	0.75**(0.54,0.93)	86.7
g) Showers and changing rooms	31	0.87	0.87	0.87**(0.66,1.00)	93.6
h) Exercise classes	31	0.70	0.67	0.71**(0.42,1.00)	90.3
i) Sport club	30	n.a.	n.a.	n.a.	96.7
j) Employer subsidized public transport / cycling	31	0.14	0.14	0.14	80.6
Commuting 4 levels (sum score of items a, b, c)	88	0.86		0.84**(0.73,0.92)	
Commuting 5 levels (sum score of items a to d)	21	0.96		0.93**(0.82,0.99)	
a) Mode of travel to local shops	91	0.63	0.73	0.75**(0.58,0.91)	92.3
b) Mode of travel to supermarket	102	0.79	0.81	0.82**(0.68,0.92)	90.2
c) Mode of travel to local services	100	0.59	0.68	0.72**(0.55,0.88)	90.0
d) Mode of travel to study or work	25	1.00	1.00	1.00**(1.00,1.00)	100.0

ICC, intraclass correlation coefficient; N, sample size.

n.a., calculation was not applicable because 0 participants reported yes in the retest.

* $P \leq 0.05$; ** $P \leq 0.01$

Table 10. Pearson correlations between both ALPHA and mode of commuting questionnaires and the long version of the IPAQ (only statistically significant values are shown).

ALPHA and IPAQ	Total				Transportation				Leisure time				Domestic
Scales	PA	MPA	VPA	Walking	Total	Walking	Cycling	Walk to work	Total	MPA	VPA	Walking	Total
Density score													
Detached houses												0.25*	0.22*
Apartment buildings or blocks of flats		-0.22*											
Distance to local facilities													
Supermarket				-0.23*	-0.25*	-0.25*							
Bus stop	-0.24*			-0.23*	-0.21*	-0.21*			-0.20*				
Availability of infrastructure									0.28**				
Availability of sidewalks									0.29**				
Availability of bike lanes													
Sidewalks					0.22*	0.22*			0.28**				
Pedestrian zones									0.24*				
Maintenance													
Total safety		0.24*											
Safety of crime		0.21*											
Safety from traffic		0.23*											
Dangerous to leave a bicycle locked		-0.20*											
Walking is dangerous because of the traffic		-0.24*											-0.19*
Aesthetics													
Pleasure													
Cycling and walking network													
Connectivity					0.22*	0.22*							
Many shortcuts for walking													-0.19*
Many different routes for walking or cycling from place to place									-0.21*		-0.28**		
Home environment													
Workplace or study environment													
Active commuting (4 levels)				0.22*									
Active commuting (5 levels)					0.41*			0.41*					
Commuting to local shops				-0.21*									

ALPHA, Assessing Levels of Physical Activity and fitness environmental questionnaire; IPAQ, International Physical Activity Questionnaire

PA, physical activity; MPA, moderate intensity physical activity; VPA, vigorous intensity physical activity. * $P \leq 0.05$; ** $P \leq 0.01$

Table 11. Pearson correlations between both ALPHA and mode of commuting and accelerometry (only statistically significant values are shown).

ALPHA and Accelerometry	Minutes per day					
Scales	Sedentary	Light	Lifestyle	MPA	MVPA	Total PA
Density score		-0.35**				
Detached houses		0.31**	0.29**			0.25*
Semi-detached townhouses or terraced houses		0.27*				
Apartment buildings or blocks of flats		-0.38**				
Distance to local facilities						
Restaurant, cafe, bar or pub					0.21*	0.21*
Availability of infrastructure				0.27*	0.27*	0.25*
Availability of sidewalks			0.22*	0.24*	0.24*	0.22*
Availability of bike lanes				0.21*	0.21*	
Cycling routes				0.26*	0.27*	0.25*
Sidewalks				0.28**	0.29**	0.27*
Maintenance						
Total safety						
Safety of crime						
Safety from traffic						
Dangerous during the day because of the level of crime		0.23*	0.22*			
Aesthetics						
Pleasure						
Cycling and walking network				0.23*	0.23*	
Connectivity	0.21*			0.25*	0.24*	
Many different routes for walking or cycling from place to place			0.21*	0.21*	0.21*	
Home environment			0.22*			
Workplace or study environment						
Active commuting (4 levels)						
Active commuting (5 levels)				0.43*	0.41*	
Commuting to work or study		0.39*				

ALPHA, Assessing Levels of Physical Activity and fitness environmental questionnaire; MPA, moderate intensity physical activity; MVPA, moderate to vigorous intensity physical activity; PA, physical activity. * $P \leq 0.05$; ** $P \leq 0.01$

Study II: Associations between patterns of active commuting and socioeconomic factors in women with fibromyalgia: the al-Ándalus project.

A total of 617 women with fibromyalgia and 257 control women took part in the study. Among women with fibromyalgia, one had severe cognitive impairment, 38 were not previously diagnosed and 92 did not meet the 1990 ACR fibromyalgia criteria. Six control women met the 1990 ACR fibromyalgia criteria and were also excluded. Additionally, we excluded from the analyses 20 participants (n=14 and n=6 for fibromyalgia and control groups) who were older than 65 years and 44 participants (n=13 and n=31 for fibromyalgia and control groups) who were younger than 37 years old. Therefore, the final study sample comprised a total of 459 women with fibromyalgia and 214 control participants.

Table 12 presents the descriptive characteristics, socioeconomic and mode of commuting variables of the study groups. Fibromyalgia patients had significant higher body fat percentage, tender points, fatigue and fibromyalgia impact (all, $p<0.001$) than controls. Fibromyalgia patients also presented significantly lower educational level, higher current occupational status and lower professional status (all, $p<0.01$) than controls. There were no group differences for the mode of commuting ($p<0.07$).

The comparison of active commuters between fibromyalgia and control groups only displayed a significant difference between groups (data not shown). Women with fibromyalgia were less active commuters to supermarket than control women ($p<0.05$). Figure 3 presents the same analysis separately for age groups, in which the younger age group had 184 women with fibromyalgia and 100 control women (except for study/work place and active worker commuters variables in fibromyalgia and control group with 81 and 53 women respectively); and the older age group had 248 women with fibromyalgia and 101 control women (except for study/work place and active worker commuters variables in fibromyalgia and control group, with 60 and 45 respectively). In the younger age group (<51 years old) women with fibromyalgia revealed a significant higher percentage of active commuting for the variable active worker commuters than control group ($p<0.05$). Regarding the older age group (≥51 years old), control group displayed a significant higher percentage of active commuting for commuting to local shops, supermarket and active commuters variables (all, $p<0.05$).

Table 13 displays the associations between active commuting and socioeconomic factors in the fibromyalgia group. Women with fibromyalgia who lived alone were more active commuters in comparison to either those living accompanied (Odd Ratio (OR): 4.39, 95% Confidence Interval (CI): 1.30 to 14.76, $p=0.017$), or living with both partner and children, only partner and only children (OR: 3.19, 95% CI: 1.07 to 9.50, $p=0.037$). There were no significant differences between civil status, educational level, current occupational status or professional status and active commuting (all, $p>0.12$). No statistically significant associations between active commuting and socioeconomic factors were observed in the control group (data not shown).

Table 12. Socioeconomic, clinical and mode of commuting variables of the participants in Study II.

Variable	n	FM Group	n	Control Group	p
Age, mean (SD)	459	52.2 (7.1)	214	51.3 (7.0)	0.122
Body fat percentage, mean (SD)	449	40.1 (7.7)	210	37.1 (7.0)	**<0.001**
Tender points, mean (SD)	459	16.8 (1.9)	214	3.1 (3.0)	**<0.001**
Fatigue, mean (SD)	442	18.0 (2.5)	202	10.4 (4.7)	**<0.001**
Fibromyalgia impact	442	65.9 (14.9)	200	20.9 (13.2)	**<0.001**
Years since clinical diagnosis, n (%)	447		N.A.		N.A.
≤ 5 years		183 (40.4)		N.A.	
>5 years		264 (59.1)		N.A.	
Civil status, n (%)	459		213		0.331
Married		350 (76.3)		155 (72.8)	
No married		109 (23.7)		58 (27.2)	
Accompaniment at home	459		214		0.801
Accompanied		423 (92.2)		196 (91.6)	
Alone		36 (7.8)		18 (8.4)	
Living with…	443		201		0.247
Partner and children		265 (59.8)		130 (64.7)	
Partner		99 (22.3)		31 (15.4)	
Children		43 (9.7)		22 (10.9)	
Alone		36 (8.1)		18 (9.0)	
Educational level, n (%)	459		214		**0.006**
University degree		62 (13.5)		49 (23.0)	
Secondary school/Professional training		130 (28.4)		67 (31.1)	
Primary school		220 (47.9)		83 (38.9)	
Unfinished studies		47 (10.2)		15 (7.0)	
Current occupational status	459		214		**<0.001**
Working/Studying		122 (26.6)		92 (43.0)	
Unemployed/Retired		337 (73.4)		122 (57.0)	
Professional status, n (%)	459		214		**<0.001**
High qualification		33 (7.2)		43 (20.1)	
Medium qualification		50 (10.9)		28 (13.1)	
Low qualification		376 (81.9)		143 (66.8)	
Active commuters	432	298 (69.0)	201	146 (72.6)	0.350
Active workers commuters	141	100 (70.9)	98	66 (67.3)	0.555
Mode of commuting to local shops, n (%)	433		201		0.168
Walk		327 (75.5)		162 (80.6)	
Bicycle		1 (0.2)		3 (1.5)	
Car		96 (22.2)		35 (17.4)	
Bus /metro /train		6 (1.4)		1 (0.5)	
Mode of commuting to supermarket, n (%)	433		201		0.075
Walk		196 (45.3)		108 (53.7)	
Bicycle		4 (0.9)		5 (2.5)	
Car		225 (52.0)		88 (43.8)	
Bus /metro /train		6 (1.4)		0 (0.0)	
Mode of commuting to local facilities, n (%)	433		201		0.222
Walk		296 (68.4)		137 (68.2)	
Bicycle		2 (0.5)		4 (2.0)	
Car		111 (25.6)		55 (27.3)	
Bus /metro /train		20 (4.6)		5 (2.5)	
Mode of commuting to study/work place, n (%)	141		98		0.103
Walk		51 (36.2)		23 (23.5)	
Bicycle		0 (0.0)		1 (1.0)	
Car		74 (52.5)		66 (67.3)	
Bus /metro /train		15 (10.6)		8 (8.2)	

N.A., not available; SD, Standard Deviation; FM, Fibromyalgia.

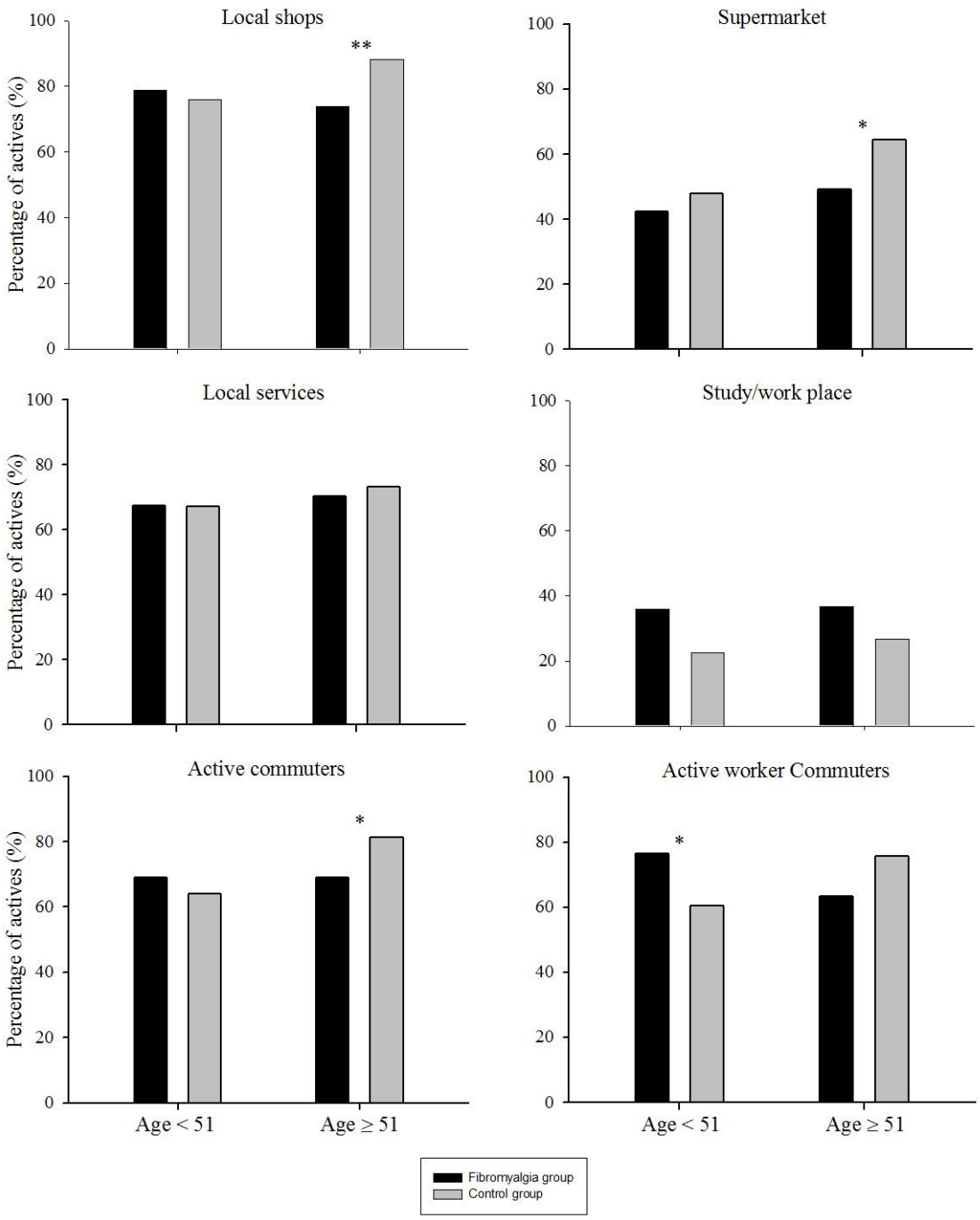


Figure 3. Percentage and comparison of active commuters in both fibromyalgia and control groups. *, p<0.05; **, p<0.01

Table 13. Associations between active commuting and socioeconomic factors in participants with fibromyalgia.

		Commuting (active *vs.* passive)		
	N	*OR*	95% CI	p
Civil status				
Married	322	1	Reference	
No married	99	1.02	0.62-1.67	0.954
Accompaniment at home				
Accompanied	390	1	Reference	
Alone	31	4.39	1.30-14.76	**0.017**
Living with…				
Partner and children	246	1	Reference	
Partner	88	0.83	0.48-1.44	0.503
Children	41	0.78	0.39-1.57	0.482
Alone	33	3.19	1.07-9.50	**0.037**
Educational level				
University degree	60	1	Reference	
Secondary school/Professional training	118	1.27	0.66-2.44	0.474
Primary school	203	1.62	0.88-2.99	0.124
Unfinished studies	40	1.42	0.58-3.45	0.440
Current occupational status				
Working/Studying	115	1	Reference	
Unemployed/Retired	306	0.81	0.50-1.32	0.397
Professional status				
High qualification	32	1	Reference	
Medium qualification	46	0.65	0.24-1.74	0.392
Low qualification	343	0.85	0.37-1.91	0.686

OR, Odds Ratio; CI, Confidence Interval.

Study III: Is active commuting associated with sedentary behaviour and physical activity in women with fibromyalgia? The al-Ándalus project.

Two hundred and ninety-five women were not previously diagnosed, 92 women did not meet the 1990 ACR fibromyalgia criteria and one woman had severe dementia. A total of 420 fibromyalgia women met the inclusion criteria and were enrolled in the study. Differences were found (Table 14) in all variables (except for pressure pain threshold, active commuting, commuting to local shops and commuting to local services) between the younger group and the older group. The older group showed a higher body fat percentage, greater time in sedentary time and light PA, lower time in moderate PA, vigorous PA, MVPA and total PA, and lower number of steps than the younger group (mean differences 3.4%, 4.0 min/day, 0.2 min/day, -9.1 min/day, -2.7 min/day, -11.4 min/day and -11.5 min/day, respectively; all $p<0.001$). Regarding to commuting variables, the older group showed a higher percentage for active commuting to supermarket than the younger group (mean difference 11.4%, $p<0.001$).

Table 15 shows differences in sedentary time, PA levels and steps count between active and passive commuting by age groups. Active commuters from both age groups spent less sedentary time than passive commuters (mean differences -40.2 min/day and -3.7 min/day, for the younger and older group, respectively; all $p\leq0.001$). In the younger group, active commuters spent more time in light PA, moderate PA, vigorous PA, MVPA, total PA and registered a higher number of steps (mean differences 8.7 min/day, 19.1 min/day, 1.9 min/day, 21.0 min/day and 2095.1 number/day, respectively; all $p<0.05$). In the older group, active commuters spent less time in light PA and vigorous PA (mean differences -1.6 min/day, -1.4 min/day, respectively; all $p<0.001$), and more time in moderate PA, MVPA, total PA and registered a higher number

of steps (mean differences 3.7 min/day, 2.3 min/day, 0.8 min/day, 521.8 number/day, respectively; all p<0.001).

The association between active commuting and sedentary time, PA levels and steps count is shown in Table 16. In the young group there was a negative association between active commuting and sedentary time (β= -29.7; p=0.008). Active commuting was positively associated (all p≤0.01) with moderate PA (β= 19.1), MVPA (β= 21.1), total PA (β= 29.7) and steps count (β= 2087.3). No association between active commuting and accelerometry outcomes were observed in the older group (all, p>0.05).

Table 14. Clinical characteristics, objectively measured sedentary time and physical activity, and mode of commuting of women with fibromyalgia.

	All		Younger group (<51 years)		Older group (≥51 years)		
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	p
Age*	420	52.0 (8.0)	185	44.6 (4.4)	235	57.9 (4.7)	**<0.001**
Pressure pain threshold *	420	2.4 (0.8)	185	2.4 (0.7)	235	2.4 (0.8)	0.963
Body fat percentage*	411	40.2 (7.6)	185	38.3 (7.8)	226	41.7 (7.1)	**<0.001**
Sedentary (min/day)†	420	661.9 (86.9)	185	664.1 (87.7)	235	660.1 (86.5)	**<0.001**
Objective PA							
Light PA (min/day)†	420	157.3 (40.3)	185	157.1 (40.3)	235	157.4 (40.4)	**<0.001**
Moderate PA (min/day)†	420	90.4 (33.9)	185	95.4 (33.7)	235	86.4 (33.5)	**<0.001**
Vigorous PA (min/day)†	420	14.2 (7.2)	185	15.7 (7.9)	235	13.0 (6.4)	**<0.001**
MVPA (min/day)†	420	104.5 (39.6)	185	111.1 (40.0)	235	99.4 (38.5)	**<0.001**
Total PA (min/day)†	420	261.8 (71.9)	185	268.2 (74.2)	235	256.7 (69.7)	**<0.001**
Steps (number/day)†	420	7,243.7 (2,930.4)	185	7,609.9 (2,901.2)	235	6,955.5 (2,927.2)	**<0.001**
Active commuting, n (%)	420	293 (69.8)	185	128 (69.2)	235	165 (70.2)	0.821
To local shops, n (%)‡	420	322 (76.7)	185	145 (78.4)	235	177 (75.3)	0.462
To supermarket, n (%)‡	420	197 (46.9)	185	75 (40.5)	235	122 (51.9)	**0.020**
To local facilities, n (%)‡	420	294 (70.0)	185	126 (68.1)	235	168 (71.5)	0.453

MVPA, moderate to vigorous physical activity; PA, physical activity; SD, Standard Deviation.

* Differences between-group were tested by ANOVA.

† Differences between-group in objective physical activity were tested by analysis of covariance. Accelerometer wearing time was used as covariate.

‡ Differences between-group were tested by chi-square.

Table 15. Differences in sedentary time, levels of physical activity, total physical activity and steps counts, between active and passive commuting.

	Active commuters		Passive commuters		p
	n	Mean (SD)	n	Mean (SD)	
Younger group (<51 years)					
Sedentary time (min/day)	128	651.68 (84.11)	57	691.88 (89.83)	**<0.001**
Light PA (min/day)	128	159.82 (39.54)	57	151.10 (41.74)	**<0.001**
Moderate PA (min/day)	128	101.31 (31.99)	57	82.24 (33.99)	**<0.001**
Vigorous PA (min/day)	128	16.25 (7.63)	57	14.33 (8.31)	**0.025**
MVPA (min/day)	128	117.56 (37.72)	57	96.58 (41.45)	**0.001**
Total PA (min/day)	128	277.37 (70.75)	57	247.68 (78.14)	**<0.001**
Steps (number/day)	128	8,255.41 (2,890.66)	57	6,160.29 (2,369.35)	**<0.001**
Older group (≥51 years)					
Sedentary time (min/day)	165	659.01 (84.64)	70	662.66 (91.30)	**<0.001**
Light PA (min/day)	165	156.90 (40.03)	70	158.46 (41.57)	**<0.001**
Moderate PA (min/day)	165	87.46 (34.73)	70	83.75 (30.49)	**<0.001**
Vigorous PA (min/day)	165	12.59 (6.11)	70	13.98 (6.82)	**<0.001**
MVPA (min/day)	165	100.05 (39.58)	70	97.74 (36.11)	**<0.001**
Total PA (min/day)	165	256.95 (69.30)	70	256.20 (71.12)	**<0.001**
Steps (number/day)	165	7,110.88 (3,075.05)	70	6,589.08 (2,527.79)	**<0.001**

MVPA, moderate to vigorous physical activity; PA, physical activity.
The analyses were controlled for age, pressure pain threshold and accelerometer wearing time.

Table 16. Associations (linear regression) between active commuting and sedentary time (min/day), physical activity intensities levels (min/day) and steps count (number/day) sort by age group.

		Constant		Active commuting	
	n	β	p	β	p
Younger group (<51 years)					
Sedentary time (min/day)	185	89.40	0.295	-29.66	**0.008**
Light PA (min/day)	185	-97.79	**0.031**	8.53	0.149
Moderate PA (min/day)	185	-7.54	0.849	19.08	**<0.001**
Vigorous PA (min/day)	185	15.93	0.094	2.06	0.099
MVPA (min/day)	185	8.40	0.859	21.14	**0.001**
Total PA (min/day)	185	-89.40	0.295	29.66	**0.008**
Steps (number/day)	185	-496.26	0.881	2,087.32	**<0.001**
Older group (≥51 years)					
Sedentary time (min/day)	235	-19.01	0.791	-3.00	0.747
Light PA (min/day)	235	-55.22	0.183	-1.69	0.753
Moderate PA (min/day)	235	61.12	0.080	5.79	0.202
Vigorous PA (min/day)	235	13.10	0.054	-1.10	0.214
MVPA (min/day)	235	74.23	0.065	4.69	0.369
Total PA (min/day)	235	19.01	0.791	3.00	0.747
Steps (number/day)	235	4,968.38	0.111	667.68	0.100

MVPA, moderate to vigorous physical activity; PA, physical activity.
The analyses were controlled for age, pressure pain threshold and accelerometer wearing time.

Study IV: Active commuting is associated with impact of fibromyalgia, health related quality of life and fatigue: the al-Ándalus project.

From the total of 579 participants who agree to participate in the study, 92 women did not meet the 1990 ACR fibromyalgia criteria, 1 woman had severe cognitive dysfunction and 36 women did not have full data on mode of commuting and symptoms variables. A final sample of 450 women with fibromyalgia was included in the present study.

Age, symptomatology characteristics and mode of commuting in participants with fibromyalgia are shown in Table 17. In comparison with the older group, the younger group had higher educational level (53.1% vs. 63.3% of no studies/Primary School; P<0.01), higher occupational status (35% vs. 19.1% of workers/students; P<0.001), lower body fat percentage (38.1 vs. 40.9; P<0.001) higher chronic pain self-efficacy total score (142.3 vs. 130.6; P<0.05), higher MFI-S general fatigue (18.3 vs. 17.7; P<0.05) and lower percentage for active commuting to supermarket (41.3 vs. 50.8%, P<0.05). However, there were no differences in accompaniment at home, pressure pain threshold, FIQR – total score, SF36 – physical and mental scores, BDI-II total score, PSQI total score, pain related catastrophizing total score and active commuting to local shops and to local services (all, P>0.05).

The differences in fibromyalgia symptomatology between active and passive commuters by age groups are shown in Table 18. In the younger group, active commuter presented significantly lower FIQR-total score (Mean difference: 7.6; Confidence interval: 2.4 – 12.8; p=0.004), MFI-S general fatigue (Mean difference: 1.0; Confidence interval: 0.3 – 1.7; p=0.009) and higher SF36-physical score (Mean difference: -3.6; Confidence interval: -5.6 – -1.6; p<0.001) than passive commuters. No differences between active and passive commuting were observed in the older group (all, P>0.05).

Differences in FIQR-total score, SF36-physical score and general fatigue of the MFI-S general fatigue between groups of combined age and mode of commuting are shown in Figure 4. Young and active commuters showed less FIQR-total score than young and passive commuters (Mean: 59.3, Standard Deviation (SD): 1.9 vs. Mean: 67.0, SD: 2.6 respectively; P<0.05). A strong difference was found in FIQR-total score between young and active commuters and old and passive commuters, although there is not a significant statistical difference (Mean: 59.3, SD: 1.9 vs. Mean: 67.5, SD: 2.1 respectively; P=0.065). Regarding the HRQoL variable, young and active commuters had higher SF36-physical scores than young and passive commuters groups (Mean: 31.5, SD: 0.8 vs. Mean: 28.0, SD: 1.1 respectively; P<0.01). Finally, any difference in MFI-S general fatigue was found between groups of combined age and mode of commuting (all, P>0.05), although young and active commuters showed less MFI-S general fatigue than young and passive commuters without significant statistical differences (Mean: 17.5, SD: 0.3 vs. Mean: 18.4, SD: 0.4 respectively; P=0.09).

Table 17. Symptomatology characteristics and mode of commuting in participants with fibromyalgia.

	All (n=450) Mean (SD)	Young group (n=194) Mean (SD)	Older group (n=256) Mean (SD)	P
Age	52.0 (8.0)	44.5 (4.4)	57.7 (4.7)	**<0.001**
Accompaniment at home (%)*	91.8/8.2	94.3/5.7	89.8/10.2	0.086
Educational level (%)†	10.7/48.2/14.9/12.0/14.2	4.1/49.0/18.6/10.8/17.5	15.6/47.7/12.1/12.9/11.7	**0.001**
Current occupational status (%)‡	26.0/74.0	35.0/65.0	19.1/80.9	**<0.001**
Body fat percentage•	39.7 (8.9)	38.1 (7.9)	40.9 (9.5)	**<0.001**
Pressure pain threshold	2.4 (0.8)	2.4 (0.7)	2.4 (0.8)	0.996
FIQR – total score	64.5 (17.0)	63.2 (17.4)	65.5 (16.6)	0.150
SF36 – physical score	29.6 (6.9)	29.9 (6.6)	29.5 (7.2)	0.529
SF36 – mental score	35.6 (12.0)	35.7 (12.6)	35.6 (11.6)	0.947
BDI-II total score	26.6 (11.5)	27.0 (12.3)	26.1 (10.9)	0.433
PSQI total score	12.8 (3.9)	12.7 (4.1)	12.9 (3.6)	0.581
Pain related Catastrophizing total score	25.1 (12.7)	25.4 (12.8)	24.9 (12.7)	0.675
Chronic pain self-efficacy total score	135.9 (55.8)	142.6 (57.4)	130.9 (54.1)	**0.027**
MFI-S General fatigue	18.0 (2.6)	18.3 (2.4)	17.7 (2.6)	**0.010**
Active commuting, n (%)	310 (68.9)	133 (68.6)	177 (69.1)	0.895
To local shops, n (%)	342 (76.0)	152 (78.4)	190 (74.2)	0.309
To supermarket, n (%)	208 (46.2)	79 (40.7)	129 (50.4)	**0.042**
To local services, n (%)	310 (68.9)	130 (67.0)	180 (70.3)	0.454

BDI-II, Beck Depression Inventory-second edition; FIQR, Revised Fibromyalgia Impact Questionnaire; MFI-S, Spanish version of the Multidimensional Fatigue Inventory; PSQI, Pittsburgh Sleep Quality Index; SD, Standard Deviation; SF36, 36-item Short-Form Health Survey.

* Accompaniment at home was presented as accompanied / alone.

† Educational level was presented as no studies / Primary school / Professional training / Secondary school / University degree.

‡ Current occupational status was presented as Working or studying / unemployed or retired.

•The sample size was n=444 (n=194 from the younger group and n=250 from the older group).

Between-group differences were tested by Student T-test for continuous variables and chi-square test for categorical variables.

Table 18. Comparison (linear regression analyses) of symptomatology characteristics between active and passive commuters of the young group (<51 years) and older group (≥51 years).

	Active commuters	Passive commuters	Difference	p
Young group (<51 years)	n=133	n=61		
	Mean (SD)	Mean (SD)	Mean (CI)	
Pressure pain threshold	2.41 (0.72)	2.33 (0.75)	-0.079 (-0303 – -0.143)	0.551
FIQR – total score	60.71 (17.98)	68.49 (14.88)	7.605 (2.422 – 12.789)	**0.004**
SF36 – physical score	31.00 (6.29)	27.46 (6.72)	-3.591 (-5.546 – -1.636)	**0.001**
SF36 – mental score	36.29 (12.14)	34.27 (13.44)	-1.866 (-5.686 – 1.954)	0.338
BDI-II total score	26.08 (11.90)	29.02 (13.01)	2.742 (-1.005 – 6.489)	0.143
PSQI total score	12.31 (4.04)	13.43 (4.27)	1.131 (-0.117 – 2.378)	0.086
Pain related Catastrophizing total score	25.17 (13.10)	25.75 (12.19)	0.620 (-3.278 – 4.517)	0.782
Chronic pain self-efficacy total score	145.65 (59.20)	135.85 (53.15)	-9.423 (-26.814 – 7.968)	0.308
MFI-S general fatigue	17.99 (2.70)	18.98 (1.60)	0.999 (0.266 – 1.731)	**0.013**
Older group (≥51 years)	n=177	n=79		
	Mean (SD)	Mean (SD)	Mean (CI)	
Pressure pain threshold	2.38 (0.76)	2.42 (0.77)	0.044 (-0.158 – 0.246)	0.541
FIQR – total score	64.99 (16.87)	66.57 (16.04)	1.734 (-2.661 – 6.129)	0.569
SF36 – physical score	29.55 (7.42)	29.20 (6.61)	-0.292 (-2.199 – 1.614)	0.822
SF36 – mental score	35.93 (11.43)	34.79 (11.90)	-1.253 (-4.332 – 1.825)	0.454
BDI total score	25.80 (10.85)	26.92 (10.95)	1.013 (-1.887 – 3.913)	0.513
PSQI total score	12.83 (3.67)	12.93 (3.60)	0.117 (-0.849 – 1.083)	0.855
Pain related Catastrophizing total score	24.83 (12.75)	24.90 (12.54)	0.308 (-3.066 – 3.681)	0.956
Chronic pain self-efficacy total score	131.83 (53.98)	128.66 (54.68)	-2.828 (-17.162 – 11.507)	0.688
MFI-S general fatigue	17.69 (2.60)	17.65 (2.62)	-0.095 (-0.785 – 0.596)	0.725

BDI-II, Beck Depression Inventory-second edition; CI, Confidence interval; FIQR, Revised Fibromyalgia Impact Questionnaire; MFI-S, Spanish version of the Multidimensional Fatigue Inventory; PSQI, Pittsburgh Sleep Quality Index; SD, Standard Deviation; SF36, 36-item Short-Form Health Survey.

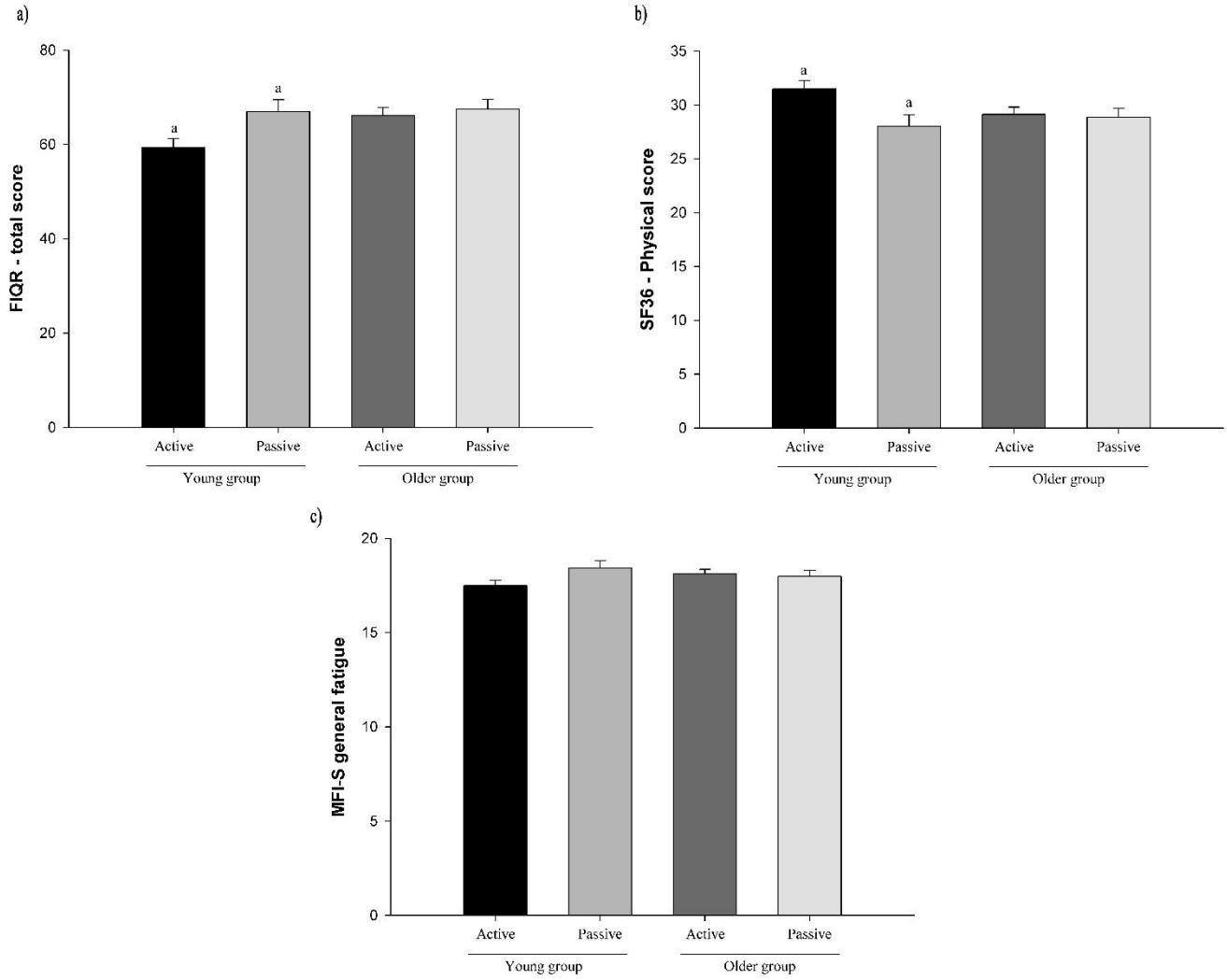


Figure 4. Differences (ANCOVA) of Fibromyalgia Impact Questionnaire Revised (FIQR), 36-item Short-Form Health Survey (SF-36) Physical Score and Spanish version of the Multidimensional Fatigue Inventory (MFI-S) general fatigue among groups of age combined with mode of commuting.
Estimated mean (bars) and standard deviation (error bar) represent values after adjustment for age. Common superscripts indicate significant ($P < 0.05$) differences between the groups with the same letter after Bonferroni's correction.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

Study V: Assessing modes and frequency of commuting to school in youngsters: a systematic review.

Study Selection

The search strategy of the 5 online databases came up with a total of 5,898 studies: 121 from PubMed, 70 from SportDiscus, 4,924 from ProQuest, 391 from National Transportation Library and 392 from Web of Knowledge, of which 5,167 remained after discarding duplicates. From these 5,167 studies, 148 had titles and abstracts which met the inclusion criteria. Ten further studies were located through a manual search of our own archives. Consequently a total of 158 studies were finally included in the review.

Study Settings and Characteristics

The characteristics of studies identified (a summary of 4 studies –out of the 158 included studies–) are set out in Table 19. The studies took place in the United States (n=36, 22.8% studies), Australia and England (n=17 per country, 10.8%), Canada (n=13, 8.2%), Belgium (n=7, 4.4%), United Kingdom and Denmark (n=5 per country, 3.2%), New Zealand, Portugal, Ireland and Norway (n=4 per country, 2.5%), Brazil, China, Germany and Spain (n=3 per country, 1.9%), Netherland, Philippines, Russia, Sweden and Switzerland (n=2 per country, 1.3%) and Cyprus, Scotland, Saudi Arabia, Colombia, Bosnia and Herzegovina, Slovenia, Finland, Vietnam, Nigeria and Iran (n=1 per country, 0.6%), thus encompassing four continents: Europe, America, Africa, Asia and Oceania. Seven of the studies were multicenter and three failed to name their location.

The sample size differed across studies. The smallest sample was 17 children, 13–15 years old[213], while the largest involved 150,147 participants, 5–14 years old[113].

Assessment of Commuting to School Self-Report Measure

1. Commuting to School Question. As far as commuting to school is concerned, 63 studies (39.8%) asked the children: "How do you usually go to school?"[14,43,50,51,111–113,132,145,147–149,152,154,157,162,172,214–259] and 93 (58.9%) of the studies mentioned that commuting to school was assessed (e.g., "We asked children about their mode of commuting to school")[41,55,110,117,118,120,121,124,125,128,131,134,135,137,139,140,142,143,150,151,153,155,156,160,213,260–325]. Two studies (1.3%) reported the exact question and mentioned that commuting to school was assessed[26,326].

2. Commuting to School Responses. Responses to the "commuting to school" question were reported in five different ways: a) modes of commuting to school (i.e., by car, on foot, by bicycle; n = 98, 62.1%)[14,26,43,50,51,55,112,117,118,120,121,124,125,128,131,132,134,137,142,145,147,149–151,156,157,162,214,216,218,219,221,222,224–231,233,235–239,243–257,259,261,262,264–268,271,272,277,281,283–285,287,290,291,294,296,298,301,303,304,307,309,311,315–320, 322,325,327]; b) frequency of commuting to school (e.g., 3 times per week; n = 5, 3.2%)[152,217,234,286,297]; c) both mode and frequency (n = 10, 6.3%)[135,172,220,232,242,278,279,306,326,328]; d) duration of commuting (n = 1, 0.6%)[41] and e) failed to report an answer (n = 44 27.8%)[110,111,113,139,140,143,153–155,160,213,215,223,240,241,258,260,263,265,269,270,273–276,280,282,288,289,292,293,295,299,300,302,305,308,310,312–314,321,323,324].

3. Trip Direction. Assessing commuting behavior can be based on either the trip to or from school or both. Studies either reported commuting mode, frequency, and other characteristics of both routes (n = 90, 57.0%)[26,50,117,120,121,124,131,134,135,142,145,147,148,150,152–155,162,215,216,218,219,221–225,227,228,231–233,235–239,242,244,247,250,253,256–266,268,269,271,273–275,277,279–281,284–286,288,290,293,294,299,301,304–311,313,314,319,320,322,324,325,327,328], solely the route to school (n = 58, 36.7%)[14,43,51,55,111–113,125,128,132,137,140,143,149,151,156,157,172,214,217,220,226,229,230,234,240,241,243,245,246,249,251,252,

254,255,267,270,272,276,278,282,283,287,289,292,295–298,300,302, 303,312,315–318,326, the route from school only (n = 1, 0.6%)[248], or did not report any route information (n = 9, 5.7%)[41,110,118,160,213,259,291, 321,323].

4. Outcome. Most studies reported the prevalence of commuting to school (n = 144, 91.1%), although these were expressed in different ways (e.g., percentage by commuting mode, percentage of active versus passive travel). The percentage of commuting by modes was reported in 51 studies (32.3%)[14,43,50,51,55,110,112,117,118,124,128,132,143,149,151,156,162,216–218,224–226,233,235,236,239,246,249,251,253,257,263,272, 276,279,283,287,289,296,302,312,315–318,320,322,323,325,327]. The percentage of active commuters to school (without specifying the mode) was reported in 12 studies (7.6%)[111,117,125,131,135,147,172, 281,290,293,315,319]. The percentage of active modes of commuting to school stratified by mode was reported in 7 studies (4.4%)[221,245,267,268,280,304,321], the percentage of modes of commuting to and from school separately was reported in 12 studies (7.6%)[139,153,155,227,237,247,256,259,274,275, 284,310], the percentage of mode of commuting without specifying the trajectory to or from school was reported by 18 studies (11.4%)[41,113,160,213,214,219,220,230,238,250,254,261,262,264,271,291,298,301], the percentage of active and passive commuting to and from school was reported by 7 studies (4.4%)[120,137,142,227,247,258,309], and the percentage of active commuting to and from school was reported by 7 studies (4.4%)[134,148,150,152,222,277,308].

5. Recall Period. With regard to the recall period, the terms usual, normal, typical and habitual were compiled as usual. Sixty-five studies (41.1%) asked for usually[14,55,111–113,120,124,125,128,131,132,137,139,149,156,157,214,215,221–226, 229,231,234,236,239,240,243,244,246–253,255,258,267,271,272,280, 281,296–298,300–302,304,307,315,317–320,322,325–327]. Other recall periods were a week (n = 10, 6.3%)[217,219,220,233,268,285,290,308,313,326], that day or today (n = 9, 5.7%)[26,43,51,121,143,235,269,284,303], the past week (n = 8, 5.0%)[148,152,162,172,242,263,275,328], a typical week (n = 7, 4.4%)[135,147,218,241,264,288,299 and yesterday (n = 7, 4.4%)[26,50,118,227,256,257,272]. The less frequent recall periods were previous 3, 5 or 7 days (n = 4, 2.5%)[237,265,286,306], during season (n = 4, 2.5%)[110,216,232,279], during 5 or 6 days (n = 2, 1.3%)[238,314], the past 12 month (n = 2, 1.3%)[154,265], a normal day (n = 2, 1.3%)[145,259], a week day (n = 1, 0.6%)[160], every weekday (n = 1, 0.6%)[117], this morning (n = 1, 0.6%)[230] and an average school week (n = 1, 0.6%)[292]. Finally, 3 studies (1.9%) reported several record periods[26,272,326] and 37 studies (23.4%) did not refer to the period in any way[41,134,140,142,151,153,155, 213,228,245,260–262,266,270,273,274,276–278,282,283,287,289,291–293,295,305,309–312,316,321,323, 324].

6. Type of Administration. One hundred fifty of the studies (94.9%) involved written questionnaires, while just 6 (3.8%)[110,112,223,262,265,287] relied on an interview and 2 (1.3%)[311,325] did not reveal how it was conducted. One hundred seven studies (67.7%) asked the question directly to the child and/or adolescent participants[14,26,41,43,50,55,113,117,120,121, 128,132,134,142,143,148,151–157,162,172,213–221,224–229,232–234, 236–241,243,246,248–255,257,258,261–265,267,268,271,272,274–277, 280,281,283–287,289–291,293–296,298,300–304,308,309,312–315,317, 321,322,326–328], 14 (8.9%) to the parents and children or adolescents together[51,112,230,235,256,260,266,269,270,282,288,297,305,316], thirty (18.9%) to the parents alone[110,124,125,131,135, 137,139,145,147,149,150,222,223,231,242,244,245,247,259,273,278,279, 299,306,307,310,319,320,323,324] and 5 (3.2%) to a member of the household[111,118,140, 160,292].

7. & 8. Reliability & Validity. As far as the validity and reliability of the self-report method, 20 studies (12.7%) reported using valid and reliable questions[41,50,51,121,134,137,215,229,230, 233,250,257,259,274,277,282,284,285,288,307], 18 studies (11.4%) used reliable questions[135,145,148,150,157, 172,216,227,239,251,264,270,278,279,294,295,299,302] and 14 (8.9%) used valid questions[117,149,151,218,232, 263,272,273,276,289,291,306,313,314]. Fourteen studies reported values for reliability[51,135,137,145,172, 216,230,235,239,251,284,285,295,299]. The reported reliability measurements were concordance (ranking from 74% to 97.5%), kappa (0.60–1.00), agreement (73–98%), correlation

coefficient (0.93), interclass and intraclass correlation test (0.70), Spearman (0.82–0.95) and ICC (0.68–0.99). Eight studies reported values for validity[51,137,230,235,263,276,284,285]. The reported validity measurements were concordance (ranking from 74% to 97.5%), Kappa (0.28–0.910) and agreement (88.4%). In addition, some studies mentioned the measurement used for obtaining the reliability[41,121,134,148,150,215,229,250,257,259,274,277–279,288,307] and validity[41,117,121,134,149,151,215,229,232,250,257,259,273,274,277,288,306,307,313,314], although they did not report these values.

Quality Assessment of the Question

The quality appraisal (in Table 20 a summary of 4 studies out of the 158 included studies are exposed) rated 36 studies (22.8%) high reporting quality (score of 7 and 8)[50,51,117,121,134,135,137,145,149,150,157,172,214,216,218,227,229,230,232,233,235,239,250,251,257,259,264,272,277,279,284,285,288,294,306,307], 8 of which scored the highest mark possible. One hundred studies (63.3%) were rated as medium reporting quality (scores of 5 and 6)[14,26,41,43,55,111–113,118,120,124,125,128,131,132,142,143,147,148,151,152,154,156,162,214,217,219–226,228,231,234,236–238,240,242–249,252–256,258,261–263,265–271,274–276,278,280,281,283,286,287,289–291,295–299,301–304,308,309,313–320,322,325–327] and 22 studies (13.9%) as low reporting quality (scores of 4 and below)[110,139,140,153,155,160,213,241,260,273,282,292,293,300,305,310–312,321,323,324,328]. The individual items that were reported most often were the "commuting to school" question, the type of administration and outcome (100.0%, 99.4% and 94.9% of the studies reported them respectively). The individual items that showed a lower quality were validity and reliability (21.5% and 24.1% of the studies reported them respectively).

Table 19. Characteristics of questions on commuting to school (4 studies out of the 158 included are exposed as an example).

Authors	Country (City)	Sample size and age (y)	Commuting to school question	Commuting to school response	Trip direction	Outcome	Recall period	Type of administration	Reliability	Validity
Carlin et al. (1997)	Australia (Melbourne and Perth)	Melbourne 3,198 (gender not reported) Perth 2,781 (gender not reported) 6-9 y	The questionnaire divided the day into four parts (before school, going to school, coming home from school and after school) and asked whether the child walked in each period	Not reported	To and from school	% mode of commuting to and from school % as pedestrian that spent ≤5 minutes	In that day	Self-reported by children and reported by parents	Not reported	Not reported
Tudor-Locke et. al. (2002)	Russia	1,094 (572 males and 522 females) 7-13 y	Questions were asked to assess typical mode of commuting to school and total duration of commute	Car, walk or bicycle	To and from school	% mode of commuting to school	Usual	Reported by parents	Not reported	Not reported
Cooper et al. (2003)	England (Bristol)	114 (59 males and 55 females) 10 y	Daily travel to school was measured using a brief questionnaire asking how the children usually traveled to and from school	Car, cycle, bus and walk	To and from school	% mode of commuting to school	Usual	Not reported	Not reported	Not reported
Evenson et al. (2003)	United States (North Carolina)	Middle school 2,151 (1,039 males and 1,108 females), High school 2,297 (1,126 males and 1,169 females) 6 -12 y	*"When the weather permits, on how many days per week do you usually walk to school?"* *"When the weather permits, on how many days per week do you usually ride a bicycle to school?"*	0-5 days	To school	% prevalence of walking and bicycling to school by number of days	Usual	Self-reported by children	Not reported	Not reported

Table 20. Quality assessment of questions on commuting to school (4 studies out of the 158 included are exposed as an example).

Authors	Commuting to school question	Commuting to school response	Trip direction	Outcome	Recall period	Type of administration	Reliability	Validity	Total score
Carlin et al. (1997)	1	0	1	1	1	1	0	0	5
Tudor-Locke et. al. (2002)	1	1	1	1	1	1	0	0	6
Cooper et al. (2003)	1	1	1	1	1	1	0	0	6
Evenson et al. (2003)	1	1	1	1	1	1	0	0	6

1, reported; 0, not reported; Rating for total score: low quality, 0-4; medium quality, 5-6; high quality, 7–8.

Study VI: Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.

A sample of 389 participants (192 children and 197 adolescents) was included in the current study. A total of 166 participants (73 children and 93 adolescents) from the initial sample were not included because they did not meet the inclusion criteria, and 45 students belonging to the same school were not included because of difficulties setting correctly the exit time for each student. Besides, for the association analyses, 353 participants (177 children and 176 adolescents) recorded a total of 5 days of PA with at least 70 minutes registered per day; additionally, for the steps analyses, 245 participants (151 children and 94 adolescents) wore GT3X or GT3X+ accelerometer models. Finally, to compare the objectively measured and self-reported journey time by Bland-Altman analyses, a total of 167 participants (71 children and 96 adolescents) who reported walking to and from school in all journeys were included.

Descriptive data

Descriptive data (Table 21) displayed differences between passive and walk participants for all travel to and from school variables (all $p<0.001$) for both children and adolescents. Furthermore, steps, sedentary time and PA levels (i.e. light, moderate and MVPA) showed differences between passive and walk participants for both children and adolescents (all $p<0.001$, except light: $p<0.05$ in both children and adolescents; and MVPA: $p=0.006$ in children). Additionally in adolescents, differences between passive and walk participants were showed in vigorous PA ($p<0.001$).

Questionnaire convergent validation

One Way Analysis of Covariance disclosed some different results for children and adolescents (Figure 5). Differences in children between passive and walk participants were shown in steps and sedentary time for each journey, except for Monday and Tuesday back from school (all $p<0.001$ except Tuesday and Thursday go to school, $p<0.05$), and in MVPA level for all week days going to school ($p<0.05$). No differences were found for light PA (all $p>0.05$). In adolescents, differences between passive and walk participants were shown in steps for each journey (all $p<0.05$, except for Tuesday back from school; $p>0.05$), in sedentary time and in PA levels (i.e. light and moderate-to-vigorous) for each journey (all $p<0.001$, except for light PA on Monday, Tuesday, Thursday and Friday go to school; $p<0.05$).

Objective vs. self-reported time

The inter-method agreement between the objective time and self-reported time from home to school is displayed in Figure 6. In children, the inter-method mean difference (objective time – self-reported time) was -4.03 minutes and the 95% limits of agreement (random error) were 13.55 and -21.60; while for adolescents was -1.39 minutes and the 95% limits of agreement (random error) were 15.23 and -18.02. Finally, one sample Student t-test showed significant differences in children ($p<0.001$), but not in adolescents ($p>0.05$).

Table 21. Demographic, travel to and from school variables and physical activity variables for the whole sample and for usual *passive* and usual *walk* participants to and from school, displayed separately by children and adolescents.

		All participants		Passive participants		Walk participants	
	n	Mean±SD	n	Mean±SD	n	Mean±SD	p
Children							
Gender (Male/Female, %)	192	50/50	75	47/53	117	53/47	0.392
Age (years)	192	10.19±0.50	75	10.15±0.39	117	10.22±0.56	0.309
Mode of commuting to school (%)*	192	55/36/3/6/0	75	0/81/4/15/0	117	90/8/2/0/0	**<0.001**
Mode of commuting from school (%)*	192	58/34/2/6/0	75	0/81/3/16/0	117	95/4/1/0/0	**<0.001**
Active journeys per week (nº)	192	5.45±4.40	75	0.49±1.43	117	8.63±2.11	**<0.001**
Objective distance from home to school (m)	179	1052.59±1070.64	70	1878.29±1270.94	109	522.32±362.72	**<0.001**
Objective time from home to school (min)	179	12.91±13.02	70	23.07±15.30	109	6.40±4.49	**<0.001**
Self-report time from home to school (min)	192	15.86±11.98	75	18.95±9.04	117	13.87±13.04	**<0.001**
Physical activity							
Steps (nº/ journey) #	100	769.32±328.63	46	628.63±246.79	54	889.15±343.80	**<0.001**
Sedentary (min/ journey)	177	18.06±3.95	71	19.48±3.05	106	17.11±4.20	**<0.001**
Light (min/ journey) #	177	7.27±3.25	71	6.50±2.04	106	7.78±3.77	**0.036**
Moderate (min/ journey) #	177	2.54±1.48	71	1.97±0.98	106	2.91±1.62	**<0.001**
Vigorous (min/ journey) #	177	1.12±0.93	71	1.02±0.93	106	1.19±0.94	0.064
Moderate to vigorous (min/journey) #	177	4.21±7.40	71	3.01±1.72	106	5.02±9.39	**0.006**
Adolescents							
Gender (Male/Female, %)	197	51/49	76	53/47	121	50/50	0.667
Age (years)	197	13.98±1.62	76	13.70±1.62	121	14.17±0.50	**0.049**
Mode of commuting to school (%)*	197	53/29/0/17/1	76	0/57/0/41/2	121	86/12/0/2/0	**<0.001**
Mode of commuting from school (%)*	197	58/25/1/16/1	76	0/58/0/41/1	121	94/5/1/0/0	**<0.001**
Active journeys per week (nº)	197	5.51±4.56	76	0.14±0.42	121	8.87±2.07	**<0.001**
Objective distance from home to school (m)	196	2172.37±3148.84	75	4282.00±4096.08	121	874.46±1,133.90	**<0.001**
Objective time from home to school (min)	197	23.72±23.33	76	39.30±29.11	121	13.93±10.46	**<0.001**
Self-report time from home to school (min)	197	20.01±13.76	76	24.83±15.55	121	17.02±11.58	**<0.001**
Physical activity							
Steps (nº/ journey) #	82	823.58±336.33	36	590.20±140.52	46	1006.22±332.55	**<0.001**
Sedentary (min/ journey)	176	16.61±3.97	66	19.72±2.11	110	14.74±3.64	**<0.001**
Light (min/ journey) #	176	6.08±2.04	66	6.40±1.70	110	5.88±2.20	**0.025**
Moderate (min/ journey) #	176	3.49±2.02	66	2.08±0.75	110	4.33±2.08	**<0.001**
Vigorous (min/ journey) #	176	2.35±2.29	66	1.10±0.85	110	3.11±2.55	**<0.001**
Moderate to vigorous (min/journey) #	176	5.84±3.48	66	3.19±1.29	110	7.43±3.42	**<0.001**

* Mode of commuting to and from school corresponds to walk/car/motorcycle/bus/other.

Log transformed data were used in the analysis and raw data are shown in the table.

SD; Standard deviation.

p, p-value of the differences between "passive" and "walk" participants.

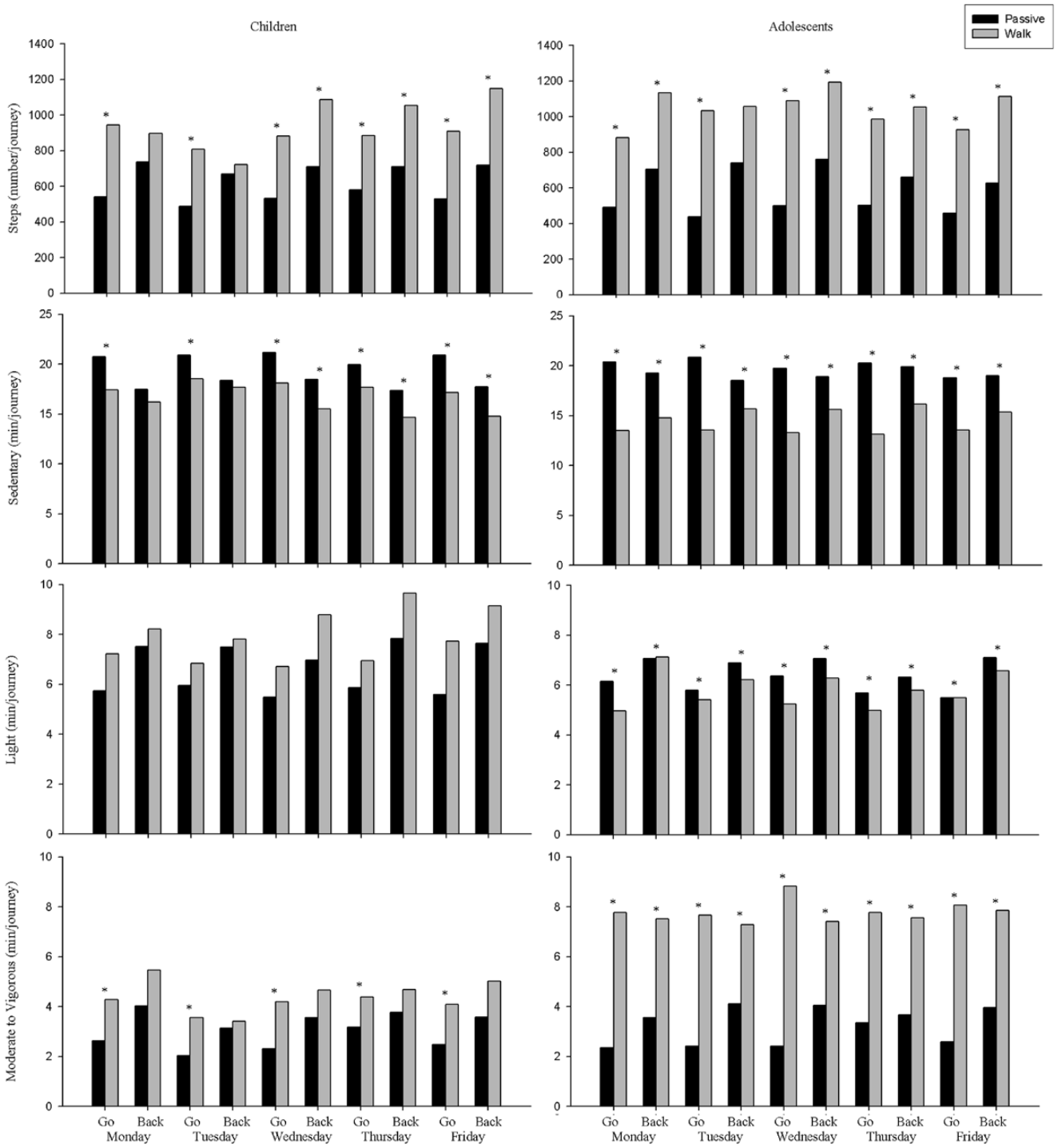


Figure 5. Step number, sedentary time and physical activity levels in *passive* and *walk* children and adolescents on their journey to and from school, controlled by distance in children and age and distance in adolescents.
* Differences between passive and walk are $p<0.05$.
Log transformed data for steps, light and moderate to vigorous were used in the analysis and raw data are shown in the figure.

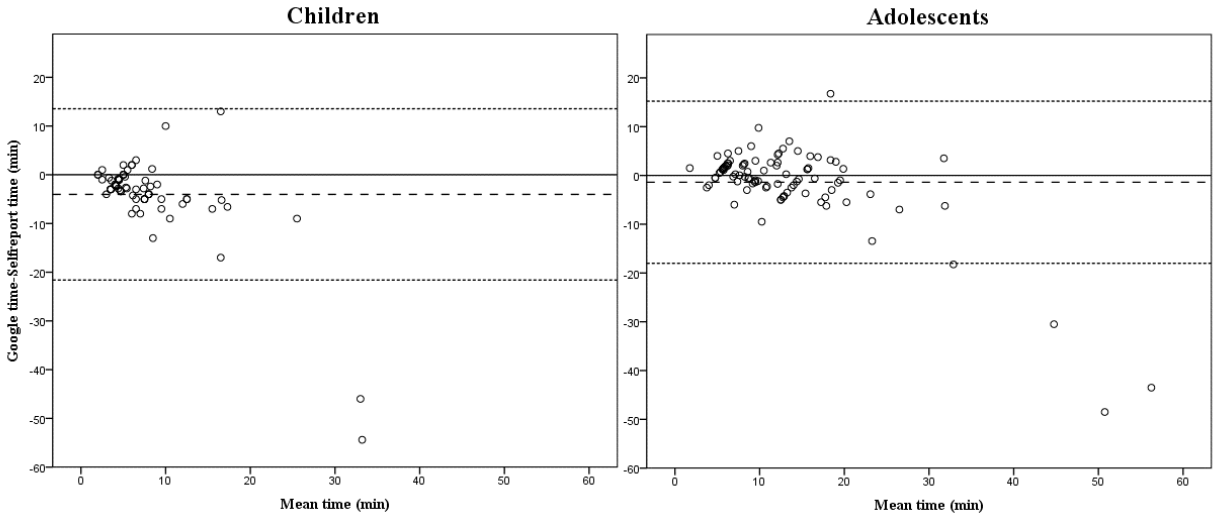


Figure 6. Bland-Altman plot of the objective time and self-report time from home to school for children and adolescents.
The central dotted line represents the mean of differences between the objective time measure and the self-report time measure; the upper and lower dotted lines represent the upper and lower 95% limits of agreement (mean differences+1.96 standard deviations of the differences), respectively. Solid lines indicates a value of zero.

Study VII: Mode of commuting TO and FROM school: a similar or different pattern?

A total of 6,004 students took part in the study and completed the questionnaire. Those students that did not complete the full questionnaire (39 participants), reported their usual school commute mode as "other" (3 participants) or indicated more than one mode (2 participants) (n=44, less than 1% of the total) were removed from the study because it was not possible to know the specific mode. After applying these criteria, the initial sample was reduced to 5,960 students (1,279 children and 4,681 adolescents).

Table 22 presents the prevalence of the usual mode of commuting to and from school together in children and adolescents. An 87.3% of the children and 89.2% of the adolescents used the same mode of commuting to and from school. The most prevalent mode of commuting to and from school was walking (i.e., 55.4% of children and 51.8% of adolescents) and the second mode was the car (i.e., 29.4% of children and 16.2% of adolescents). Figure 7 shows significant differences between the mode of commuting to and from school for walking ($p<0.001$) and car ($p<0.001$) in children and adolescents, and for bus ($p=0.001$) only in adolescents. Percentages for walking and commuting by bus are higher on the way back from school compared to the way to school, and percentages of commuting by car are lower on the way back from school compared to the way to school.

Differences between the usual mode and the number of daily journeys in the last week, for each usual mode of commuting, are shown in Table 23. Children and adolescents that usually walked, reported to walk a mean of 4.8 journeys per week on the way to or from school (maximum is 5 journeys) and a mean of 9.0 journeys per week on the way to and from school (i.e. total, maximum is 10 journeys).

Table 22. Prevalence of the usual mode of commuting to school and the usual mode of commuting from school in children and adolescents.

Children										
To school	**From school**									
	Walk		Bike		Car		Motorbike		Bus	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Walk	709	(55.43)	0	(0.00)	33	(2.58)	2	(0.16)	1	(0.08)
Bike	1	(0.08)	0	(0.00)	1	(0.08)	0	(0.00)	0	(0.00)
Car	105	(8.21)	0	(0.00)	376	(29.40)	2	(0.16)	5	(0.39)
Motorbike	2	(0.16)	0	(0.00)	2	(0.16)	1	(0.08)	0	(0.00)
Bus	2	(0.16)	0	(0.00)	6	(0.47)	0	(0.00)	31	(2.42)
Adolescents										
To school	**From school**									
	Walk		Bike		Car		Motorbike		Bus	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Walk	2,429	(51.89)	0	(0.00)	116	(2.48)	4	(0.09)	18	(0.38)
Bike	1	(0.02)	14	(0.30)	2	(0.04)	0	(0.00)	0	(0.00)
Car	220	(4.70)	0	(0.00)	759	(16.21)	4	(0.09)	75	(1.60)
Motorbike	5	(0.11)	0	(0.00)	3	(0.06)	7	(0.15)	2	(0.04)
Bus	25	(0.53)	0	(0.00)	28	(0.60)	1	(0.02)	968	(20.68)

Go, the usual mode of commuting to school. Back, the usual mode of commuting from school. Percentages refer to the total of participants (e.g. 55.43% of the participants usually walked to and from school; 2.58% of the participants usually walked to school and used the car from school).

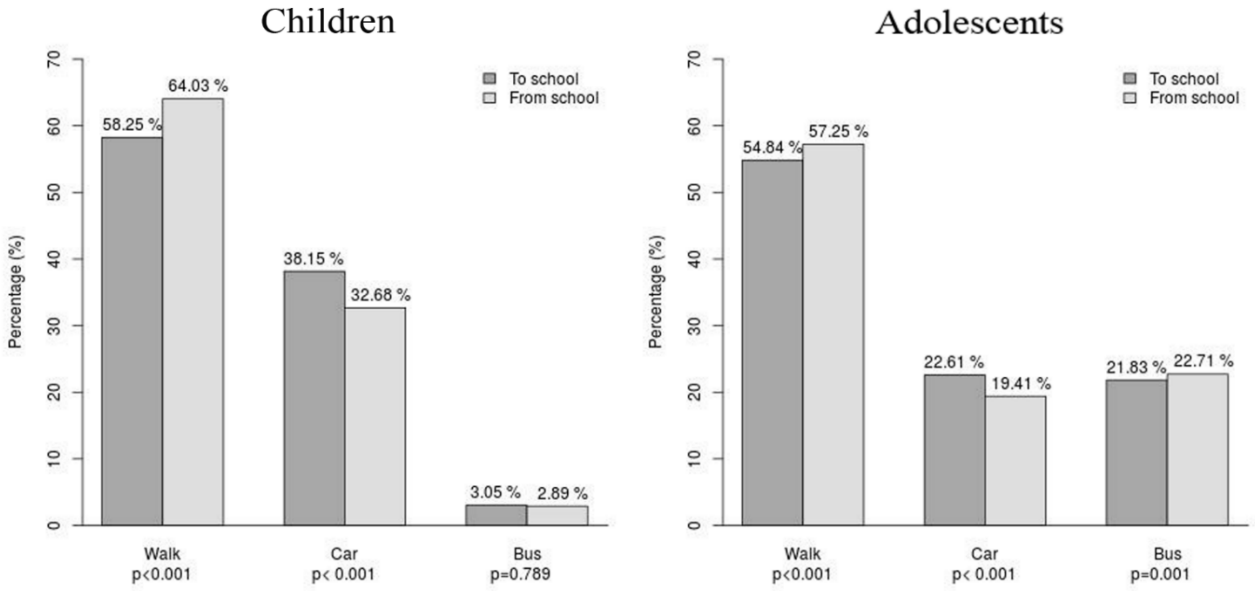


Figure 7. Differences between the usual mode of commuting to school and the usual mode of commuting from school in children and adolescents.

Table 23. Differences between usual and daily mode of commuting in the last week.

Children (n=1,279)									
Usual mode of commuting			Daily mode of commuting (number of journeys per week)						Total
			0	1	2	3	4	5	N (Mean ± SD)
To school	Walk	n (%)	2 (0.27)	1 (0.13)	4 (0.54)	31 (4.16)	37 (4.97)	670 (89.93)	745 (4.83±0.57)
	Car	n (%)	1 (0.20)	4 (0.82)	22 (4.51)	33 (6.76)	32 (6.56)	396 (81.15)	488 (4.62±0.88)
	Bus	n (%)	1 (2.56)	1 (2.56)	1 (2.56)	3 (7.69)	1 (2.56)	32 (82.05)	39 (4.51±1.19)
From school	Walk	n (%)	4 (0.49)	5 (0.61)	15 (1.83)	41 (5.01)	46 (5.62)	708 (86.45)	819 (4.74±0.76)
	Car	n (%)	2 (0.48)	2 (0.48)	12 (2.87)	32 (7.66)	25 (5.98)	345 (82.54)	418 (4.66±0.84)
	Bus	n (%)	0 (0.00)	1 (2.70)	1 (2.70)	3 (8.11)	3 (8.11)	29 (78.38)	37 (4.57±0.96)
			0-1	2-3	4-5	6-7	8-9	10	
Total	Walk	n (%)	4 (0.56)	13 (1.83)	80 (11.28)	37 (5.22)	61 (8.60)	514 (72.50)	709 (8.91±2.06)
	Car	n (%)	2 (0.53)	18 (4.79)	70 (18.62)	41 (10.9)	24 (6.38)	221 (58.78)	376 (8.15±2.52)
	Bus	n (%)	0 (0.00)	2 (6.45)	9 (29.03)	1 (3.23)	4 (12.90)	15 (48.39)	31 (7.74±2.65)
Adolescents (n=4,681)									
Usual mode of commuting			Daily mode of commuting (number of journeys per week)						Total
			0	1	2	3	4	5	N (Mean ± SD)
To school	Walk	n (%)	12 (0.47)	3 (0.12)	12 (0.47)	47 (1.83)	68 (2.65)	2,425 (94.47)	2,567 (4.89±0.52)
	Car	n (%)	11 (1.04)	2 (0.19)	12 (1.13)	32 (3.02)	47 (4.44)	954 (90.17)	1,058 (4.80±0.72)
	Bus	n (%)	7 (0.68)	3 (0.29)	8 (0.78)	15 (1.47)	25 (2.45)	964 (94.32)	1,022 (4.88±0.60)
From school	Walk	n (%)	6 (0.22)	5 (0.19)	16 (0.60)	49 (1.83)	99 (3.69)	2,505 (93.47)	2,680 (4.89±0.49)
	Car	n (%)	14 (1.54)	6 (0.66)	18 (1.98)	43 (4.74)	75 (8.26)	752 (82.82)	908 (4.66±0.91)
	Bus	n (%)	2 (0.19)	2 (0.19)	8 (0.75)	21 (1.98)	37 (3.48)	993 (93.41)	1,063 (4.89±0.50)
			0-1	2-3	4-5	6-7	8-9	10	
Total	Walk	n (%)	7 (0.29)	17 (0.70)	292 (12.02)	70 (2.88)	155 (6.38)	1,888 (77.73)	2,429 (9.11±1.87)
	Car	n (%)	11 (1.45)	13 (1.71)	244 (32.15)	44 (5.80)	53 (6.98)	394 (51.91)	759 (7.77±2.60)
	Bus	n (%)	2 (0.21)	8 (0.83)	75 (7.75)	13 (1.34)	38 (3.93)	932 (85.95)	968 (9.41±1.63)

SD, standard deviation.

Study VIII: Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.

A total of 6,979 students participated in the study, from which 7 participants were excluded because they did not report age or gender. A final sample of 6,972 participants were therefore included in the study and 209,160 journey observations (i.e. 30 journey observations per participant) were recorded. A total of 45,314 journey observations (22%) did not meet the inclusion criteria. The final sample size was 163,846 journey observations (see Figure 8).

Table 24 describes the characteristics of the participants, mode of commuting and weather variables within each season. Statistically significant differences in age, gender, usual mode of commuting to school, usual mode of commuting from school and daylight were apparent between autumn, winter and spring (all, $p<0.001$).

Table 25 shows descriptive characteristics of the journey observations. There was a difference in average distance from home to school between active and passive journeys. The average active journey length was 763m (SD 1,015), compared to 5,277m (SD 6,295) for passive journeys. Direct sunlight, temperature and wind speed were all on average higher on active journeys, and precipitation was lower. There were differences in age, gender, way and season between active transport and passive transport modes (all, $p<0.001$).

Age, gender, way, daylight, direct sunlight, mean temperature, mean wind, total precipitation and season all showed statistically significant ($p<0.05$) associations with mode of commuting (i.e. Active transport and Passive transport) in multivariable models (Data not shown). Table 26 shows the results of multilevel models stratified by direction of commuting. With higher total precipitation, children were more likely to commute actively to school (OR: 1.01, 95% CI: 1.00-1.02, $p=0.047$) and in winter, children were less likely to choose an active mode of commuting to school (OR: 0.72, 95% CI: 0.59-0.89, $p=0.003$). In spring, adolescents were more likely to choose an active mode of commuting to school (OR: 1.43, 95% CI: 1.19-1.73, $p<0.001$); and with higher mean temperature,

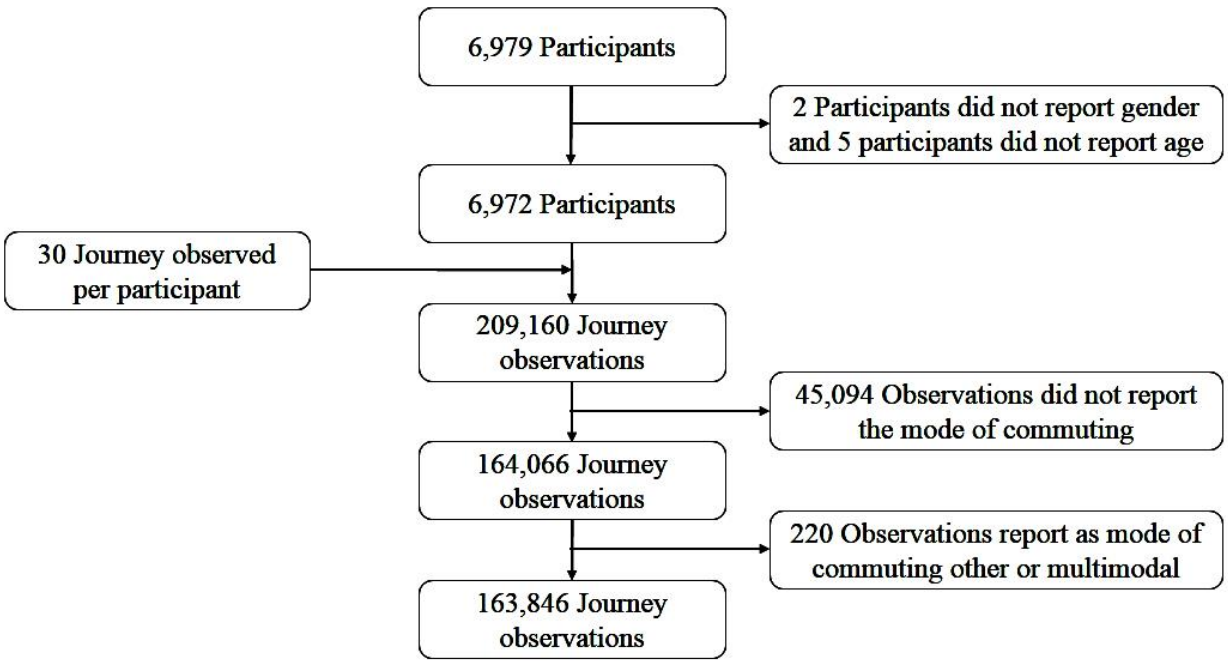


Figure 8. Flow chart of sample journey observations.

adolescents were more likely to choose an active mode of commuting for returning from school (OR: 1.02, 95% CI: 1.00-1.04, p=0.029).

Table 27 shows the results of multilevel binary logistic regression models between mode of commuting in each journey (i.e. active transport and passive transport) with direction and weather variables stratified by usual mode of commuting. Children and adolescents were more likely to choose an active mode of commuting (all, p<0.001) on the journey home from school, regardless of whether they reported being usually active travellers or usually passive travellers. For usually active commuters, children were more likely to choose an active mode of commuting with higher mean temperature (OR: 1.02, 95% CI: 1.00-1.03, p=0.025) and adolescents were more likely to choose an active mode of commuting with higher mean wind speed (OR: 1.02, 95% CI: 1.01-1.03) and in spring (OR: 1.13, 95% CI: 1.06-1.21), (all, p<0.001). Moreover, with more time with direct sunlight, children were less likely to choose an active mode of commuting (OR: 0.98, 95% CI: 0.96-0.99, p=0.030); and with a higher mean temperature (OR: 0.98, 95% CI: 0.97-0.99) and a higher total precipitation (OR: 0.99, 95% CI: 0.99-0.99), adolescents were less likely to choose an active mode of commuting (all, p<0.001).

For usually passive commuters, in spring, children were more likely to choose an active mode of commuting (OR: 1.32, 95% CI: 1.05-1.65, p=0.016); and with higher mean temperature (OR: 1.04, 95% CI: 1.02-1.06) and higher mean wind speed (OR: 1.06, 95% CI: 1.04-1.09), adolescents were more likely to choose an active mode of commuting (all, p<0.001). Additionally, in winter, adolescents were less likely to choose an active mode of commuting (OR: 0.77, 95% CI: 0.64-0.92, p=0.003).

Table 24. Descriptive characteristics of the study participants and weather stations.

	Autumn n=6,003 Mean±SD	Winter n=5,333 Mean±SD	Spring n=5,159 Mean±SD
Age (years)	13.4±2.2 [a,b]	13.5±2.2 [a,c]	13.7±2.2 [b,c]
Gender (Male %/Female %)	50.2/49.8 [a,b]	51.1/48.9 [a,c]	50.8/49.2 [b,c]
Usual mode of commuting to school (%)*	55.6/0.3/25.8/0.4/17.7/0.1/0.1 [a,b]	54.8/0.2/26.3/0.4/18.1/0.1/0.1 [a,c]	55.0/0.4/26.3/0.4/17.7/0.1/0.1 [b,c]
Usual mode of commuting from school (%)*	58.7/0.3/22.1/0.4/18.4/0.0/0.1 [a,b]	57.7/0.2/22.4/0.5/19.0/0.1/0.1 [a,c]	57.5/0.4/23.0/0.5/18.4/0.1/0.1 [b,c]
Walk distance (m)•	2,672.7±4,770.6	2,726.8±4,730.1	2,713.6±4,820.9
Daylight (h/day)‡	9.8±0.2 [a,b]	10.6±0.4 [a,c]	14.1±0.1 [b,c]
Direct sunlight (h/day) ‡	6.2±1.8	6.6±3.6	7.0±2.9
Mean temperature: 7-15 h (ºC) ‡	12.7±2.9 [b]	11.0±4.5 [c]	17.0±4.4 [b,c]
Mean wind: 7-15 h (m/s) ‡	1.4±1.4 [a,c]	2.7±2.4 [a]	3.5±2.2 [c]
Number of days raining (%)‡ #	79.0/21.0/0/0/0 [a,c]	30.0/40.0/15.0/5.0/10.0 [a]	16.7/44.4/33.3/5.6/0 [c]
Total precipitation: 7-15 h (L/m^2) ‡ †	0/0/0/16	0/0/1/18	0/0/0/88

* "Mode of commuting to/from school" correspond to walk/cycle/car/motorcycle/bus/other/multimodal.

• Sample size for walk distance is as follow: autumn, n=5,768; winter, n=5,178; and spring, n=5,014.

‡ Sample size for weather variables correspond to weather stations of which data were collected. Sample size is as follow: autumn, n=19; winter, n=20; and spring, n=18.

"Number of days raining" correspond to 0/1/2/3/4 days raining, out of a maximum of 5 weekdays.

† "Total precipitation: 7-15 h" correspond to p25/p50/p75/max

SD: Standard deviation.

[a] Differences between autumn and winter $p<0.001$

[b] Differences between autumn and spring $p<0.001$

[c] Differences between winter and spring $p<0.001$

Table 25. Descriptive characteristics of the journeys which combines the observations from the 3 seasons studied.

	Total n=163,846 Mean±SD	Active transport n=92,792 Mean±SD	Passive transport n=71,054 Mean±SD	p
Age (years)	13.5±2.2	13.5±2.2	13.57±2.14	**<0.001**
Gender (Male %/Female %)	50.4/49.5	51.5/48.5	49.3/50.7	**<0.001**
Way (Go/Back, %)	50.0/50.0	48.9/51.1	51.5/48.5	**<0.001**
Walk distance (m)*	2,708.5±4,781.4	736.2±1,015.3	5,277.6±6,295.3	**<0.001**
Daylight (h/day)	11.4±1.9	11.4±1.9	11.4±1.9	0.111
Direct sunlight (h/day)	7.0±2.9	7.1±2.9	6.9±2.8	**<0.001**
Mean temperature: 7-15 h (ºC)	13.8±4.5	14.1±4.4	13.5±4.7	**<0.001**
Mean wind: 7-15 h (m/s)	3.0±2.8	3.3±2.9	2.7±2.6	**<0.001**
Total precipitation: 7-15 h (L/m^2)	2.3±10.3	2.2±9.8	2.4±10.9	**<0.001**
Season: autumn/winter/spring (%)	36.5/32.4/31.1	36.9/32.1/31.0	36.0/32.8/31.2	**<0.001**

* Sample size for walk distance is as follow: total, n=158,544 (96.8%); Active transport, n=89,690 (96.7%) and Passive transport, n=68,854 (96.9%).
SD: Standard deviation.

Table 26. Odds ratios of active commuting with weather variables analysed with a multilevel logistic regression model (clustered by direction of travel).

	Go to school				Come back from school			
All sample	OR	95% CI		P	OR	95% CI		P
Direct sunlight (hours)	0.99	0.97	1.01	0.156	0.99	0.97	1.01	0.212
Mean temperature: 7-15 h (ºC)	1.01	0.99	1.03	0.231	1.02	1.01	1.04	**0.009**
Mean wind: 7-15 h (m/s)	1.01	0.98	1.03	0.537	0.99	0.97	1.01	0.312
Total precipitation: 7-15 h (L/m^2)	1.00	1.00	1.01	0.708	1.00	1.00	1.01	0.554
Season								
Winter	0.96	0.85	1.08	0.460	0.97	0.87	1.09	0.652
Spring	1.33	1.15	1.54	**<0.001**	1.08	0.94	1.23	0.275
Children	OR	95% CI		P	OR	95% CI		P
Direct sunlight (hours)	1.01	0.97	1.04	0.766	0.98	0.95	1.01	0.140
Mean temperature: 7-15 h (ºC)	1.02	0.99	1.05	0.294	1.02	1.00	1.06	0.122
Mean wind: 7-15 h (m/s)	0.99	0.96	1.03	0.723	1.00	0.96	1.03	0.793
Total precipitation: 7-15 h (L/m^2)	1.01	1.00	1.02	**0.047**	1.00	0.99	1.01	0.688
Season								
Winter	0.72	0.59	0.89	**0.003**	0.89	0.73	1.09	0.252
Spring	1.22	0.97	1.54	0.095	1.10	0.88	1.37	0.414
Adolescents	OR	95% CI		P	OR	95% CI		P
Direct sunlight (hours)	0.98	0.96	1.00	0.062	1.00	0.98	1.02	0.713
Mean temperature: 7-15 h (ºC)	1.00	0.99	1.02	0.718	1.02	1.00	1.04	**0.029**
Mean wind: 7-15 h (m/s)	1.01	0.98	1.04	0.652	0.98	0.96	1.01	0.231
Total precipitation: 7-15 h (L/m^2)	1.00	0.99	1.00	0.440	1.00	1.00	1.01	0.297
Season								
Winter	1.10	0.95	1.28	0.217	1.05	0.91	1.20	0.542
Spring	1.43	1.19	1.73	**<0.001**	1.06	0.90	1.26	0.479

OR: Odds Ratio. CI: Confidence Interval

Table 27. Odds ratios of active commuting with weather variables analysed with a multilevel logistic regression model (clustered by usual mode of commuting).

	Usually active commuting				Usually passive commuting			
	Active vs. Passive (per journey)				Active vs. Passive (per journey)			
All sample	OR	95% CI		P	OR	95% CI		P
Way: Come back	1.44	1.39	1.50	**<0.001**	1.49	1.35	1.65	**<0.001**
Direct sunlight (hours)	0.99	0.98	0.99	**0.004**	1.01	0.99	1.03	0.614
Mean temperature: 7-15 h (ºC)	0.99	0.98	0.99	**<0.001**	1.04	1.02	1.05	**<0.001**
Mean wind: 7-15 h (m/s)	1.02	1.01	1.02	**<0.001**	1.05	1.03	1.07	**<0.001**
Total precipitation: 7-15 h (L/m^2)	0.99	0.99	0.99	**0.002**	1.01	1.00	1.01	**0.021**
Season								
Winter	0.96	0.91	1.02	0.157	0.81	0.70	0.93	**0.002**
Spring	1.10	1.04	1.17	**0.002**	0.96	0.84	1.10	0.543
Children	OR	95% CI		P	OR	95% CI		P
Way: Come back	1.43	1.33	1.55	**<0.001**	1.46	1.25	1.71	**<0.001**
Direct sunlight (hours)	0.98	0.96	0.99	**0.030**	1.02	0.98	1.05	0.374
Mean temperature: 7-15 h (ºC)	1.02	1.00	1.03	**0.025**	1.00	0.98	1.03	0.839
Mean wind: 7-15 h (m/s)	1.00	0.99	1.01	0.974	1.00	0.98	1.03	0.805
Total precipitation: 7-15 h (L/m^2)	1.00	1.00	1.01	0.216	1.00	1.00	1.01	0.374
Season								
Winter	0.90	0.81	1.01	0.064	0.86	0.68	1.09	0.219
Spring	0.96	0.86	1.08	0.538	1.32	1.05	1.65	**0.016**
Adolescents	OR	95% CI		P	OR	95% CI		P
Way: Come back	1.45	1.38	1.52	**<0.001**	1.52	1.34	1.72	**<0.001**
Direct sunlight (hours)	0.99	0.98	1.00	0.098	1.00	0.98	1.03	0.876
Mean temperature: 7-15 h (ºC)	0.98	0.97	0.99	**<0.001**	1.04	1.02	1.06	**<0.001**
Mean wind: 7-15 h (m/s)	1.02	1.01	1.03	**<0.001**	1.06	1.04	1.09	**<0.001**
Total precipitation: 7-15 h (L/m^2)	0.99	0.99	0.99	**<0.001**	1.00	1.00	1.01	0.212
Season								
Winter	0.99	0.92	1.05	0.673	0.77	0.64	0.92	**0.003**
Spring	1.13	1.06	1.21	**<0.001**	0.91	0.77	1.08	0.287

OR: Odds Ratio. CI: Confidence Interval

Study IX: Active commuting to school: a daily opportunity to improve children's independent mobility.

From the total of 745 children who were invited to take part in the study, 19 children did not report accompaniment and/or safety data, 73 did not report the mode of commuting to school and 1 participant reported several modes of commuting to school. A final sample of 652 children (339 males and 313 females) were included in the analyses.

Table 28 presents descriptive characteristic of participants. Gender differences were not found between age groups. Old children had significantly more percentage for commuting to school alone or with other children (all $p<0.050$) and also perceived more safety (all $p<0.001$) than young children. Middle and old children had significantly more percentage for active commuting to school than young children (all, $p<0.050$).

Figure 9 displayed percentages of the different accompaniment options (i.e. alone, other children and adults) among the different age groups in participants who reported an active mode of commuting. Children reporting active and independent commuting to school (i.e. alone or other children) were distributed: 3% in young children, 9% in middle children and a

24% in old children from the total sample size. There were significant differences in the accompaniment mode on active commuting to school between old children and both young and middle children (all p<0.001). The accompaniment mode with adults was analysed independently using chi squared test and there were differences among old children and both young and middle children (all p<0.001), but not among young and middle children (p=0.051).

Finally, associations between safety perception and accompaniment mode (i.e. independent vs. adults) among children who commute to school actively clustered by age groups are shown in Table 29. In both middle and old children, those active commuters who commute independently perceived more safety that those who were accompanied with adults (all, p<0.010).

Table 28. Descriptive characteristics of the participants in Study IX

	Young children (n=150)	Middle children (n=273)	Old children (n=229)
Age (mean±SD, years)	7.25±0.44 [a,b]	9.01±0.50 [a,c]	11.09±0.49 [b,c]
Gender (male/female, %)	54/46	54/46	48/52
Accompaniment (alone/children/adults, %)	1/2/97 [a,b]	6/4/90 [a,c]	14/12/74 [b,c]
Accompaniment (independent*/adults, %)	3/97 [a,b]	10/90 [a,c]	26/74 [b,c]
Safety (safety/unsafety, %)	10/90 [a,b]	41/59 [a,c]	62/38 [b,c]
Active commuting to school (active/passive, %)	47/53 [a,b]	60/40 [a]	61/39 [b]

[a] Differences between young and middle children p<0.050

[b] Differences between young and old children p<0.001

[c] Differences between middle and old children p<0.001

* Independent includes alone and children´s accompaniment modes.

SD; Standard deviation

Table 29. Associations between safety perception and accompaniment for active commuting to school clustered by age groups.

Accompaniment mode	Safety			
	N	OR	95% CI	p
Young children				
Adults	67	1	Reference	
Independent	4	4.386	0.331 – 5.882	0.262
Middle children				
Adults	140	1	Reference	
Independent	24	11.111	3.049 – 40.000	**<0.001**
Old children				
Adults	85	1	Reference	
Independent	54	3.817	1.511 – 9.709	**0.005**

OR: odds ratio; CI: confidence interval.

Independent: accompaniment alone or with other children.

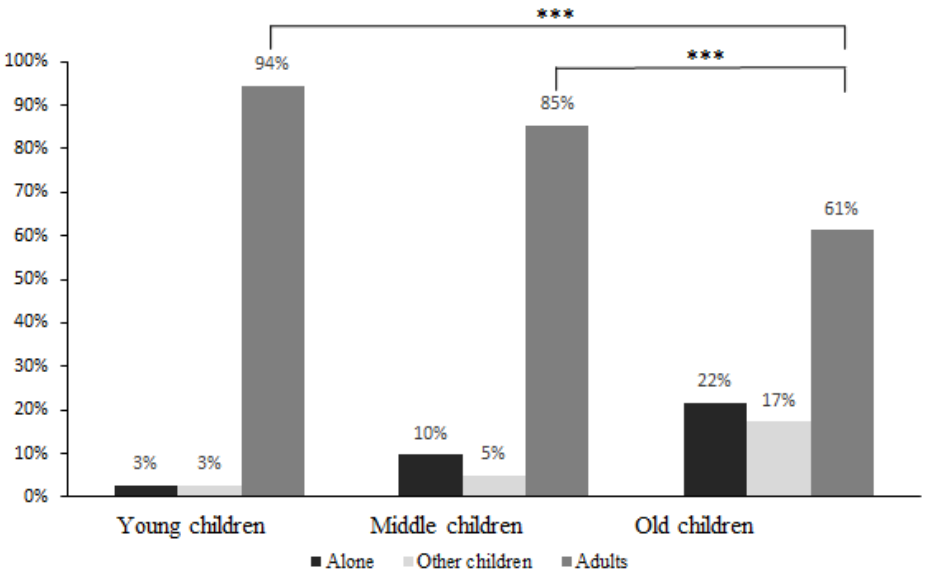


Figure 9. Percentages of the accompaniment mode (i.e., alone, other children and adults) among active commuters in different age groups (i.e., young, middle and old children); and differences between the adults accompaniment mode between age groups.

Sample size are n=71, n=164 and n=139 for young, middle and old children respectively.

P trend <0.001 between young and old children, and between middle and old children age groups

*** Differences between age groups among adults accompaniment mode; p<0.001

DISCUSSION

Foo Fighters
Wasting Light (2011)
Walk

DISCUSSION

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV).

The main findings of the Project I comprised in the current Doctoral Thesis suggest that: I) the Spanish version of the ALPHA environmental questionnaire showed moderate-to-good test–retest reliability and a weak association, as assessed with self-reported and objectively measures, with PA among female fibromyalgia sufferers patients in Spain; II) Older women with fibromyalgia (≥ 51 years old) were less active commuters than healthy women of the same age, and women with fibromyalgia who lived alone were more likely to be active commuters than those living accompanied; III) Differences among sedentary time, all PA intensity levels and steps count were found between active and passive commuters, being active commuters more physically active. Overall, linear regression analysis showed associations between active commuting and sedentary time, moderate PA, MVPA, total PA and step count, yet solely in the younger group (patients aged <51 years old); IV) Among women with fibromyalgia, only those who are younger and active commuters reported lower fibromyalgia impact and fatigue, and higher HRQoL than those younger and passive commuters, while no differences in symptoms were found between older women with fibromyalgia who commute actively vs. passively; being the results consistent except for fatigue when groups of combined age and mode of commuting (i.e. younger and active commuters, younger and passive commuters, older and active commuters and older and passive commuter) are compared: younger and active commuters showed better fibromyalgia impact and HRQoL than their younger and passive counterparts, although the differences found were relatively small.

Study I: Reliability of the ALPHA environmental questionnaire and its association with physical activity in female fibromyalgia patients: the al-Ándalus project.

Several statistical indexes were employed (ICC, weighted kappa, Spearman's correlation and proportion of agreement) to study test–retest reliability, all of which provided consistent results for each environmental score (scales and items) of the ALPHA questionnaire. The internal consistency was low overall. Only three scales (20.0%) (availability of infrastructure, availability of sidewalks and availability on bike lines) obtained a Cronbach's $\alpha > 0.80$. Four scales (26.7%) obtained an acceptable internal consistency (Cronbach's $\alpha > 0.70$) and three scales (20.0%) obtained a questionable internal consistency (Cronbach's $\alpha > 0.60$). Four scales (26.7%) obtained an unacceptable to low internal consistency (Cronbach's $\alpha \leq 0.60$). Home environment and work or study environment scales obtained the highest internal consistency, one possible reason being that they are more objective and constant perceptions. More than 70% of the scales and items showed good reliability regarding the ICC and the weighted kappa indexes. More than 95% of the scales and items were significant regarding the Spearman's correlation. Additionally, more than 76% of the items showed an inter-agreement higher than 50%. Our results confirm that the ALPHA environmental questionnaire is a reliable tool for fibromyalgia patients. The current results concur with previous studies focused on the reliability of the ALPHA environmental questionnaire in healthy people[181,329]. Only the scales of pleasant, aesthetics, cycling and walking network and connectivity showed a lower ICC in this study compared to that of the paper-and-pencil version[181]. This could be induced by the symptomatology of fibromyalgia sufferers (i.e. pain or depression), which might affect the perception of the subjective scales. The scale workplace and study environment showed a higher ICC in this study compared to the computer-assisted self-

administered German version[329]. However, these values might occur because the samples on these scales were severely reduced since only a low percentage of fibromyalgia sufferers worked or studied. Finally, the results of the weighted kappa in this study were higher than those derived from the computer-assisted self-administered German questionnaire with regards to most of the dichotomous items[329]. All the differences found between healthy people and fibromyalgia sufferers in the ALPHA questionnaire could be explained by an alteration of the perception on the environment, which might be produced by the disorder in the regulation of pain and the decrease of their functional capacity.

Regarding the comparison between neighbourhood environment and PA measured with both self-reported and objectively measurements, we found weak and moderate bivariate correlations. There were bivariate correlations between some environmental scores from the ALPHA questionnaire and moderate-intensity PA-related total, PA-related transportation and PA-related leisure time assessed with the IPAQ. Two previous studies have compared the ALPHA environmental questionnaire with the IPAQ in healthy people, finding more tenuous associations than in the current study[181,329]. The computer-assisted version showed significant values for cycling and walking-to-work-related transport and moderate-intensity PA-related leisure time[329]. The paper-and-pencil version showed significant values for cycling and walking-to-work-related transport[181]. In this study, cycling-to-work-related transportation was not correlated because the only PA reported by the participants for transportation was walking. We speculate that most of the participants either did not own a bicycle or suffered pain when attempting to use this mode of transportation. These results must be interpreted with caution because previous studies have suggested that the short-form IPAQ is not a reliable and valid tool for assessing PA among people suffering from fibromyalgia[106,330]. These authors concluded that those fibromyalgia patients with fewer alterations on their perceptions (i.e. better pain regulation) reported being more physically active than those fibromyalgia patients with more alterations on their perceptions. For this reason, accelerometry was included in the study to provide an objective measurement of PA.

Bivariate correlations were found between some environmental scores in the ALPHA questionnaire with objective measurements of moderate-intensity PA and MVPA, whilst a previous study using accelerometry showed a lower degree of association between environmental scales and PA[181]. Several environmental scales, such as safety from traffic, aesthetics, workplace or study environment, home environment, cycling and walking network and connectivity, were related to different levels of PA (i.e. MVPA, vigorous PA, leisurely PA and total AP)[181]. The home environment, cycling and walking network and connectivity scales were also significant in Study I.

Objective and self-reported measurements of PA were used. Differences between accelerometry and the IPAQ have been reported elsewhere. Accelerometry is an objective measurement of the quantity and intensity of PA whilst PA questionnaires such as the IPAQ might provide more information about the context of the activity and about unregistered and missed activity time when using the accelerometer[331]. This might explain the slight differences in the results of the current study (i.e. on safety issues) when comparing the ALPHA questionnaire with the IPAQ or accelerometry. Recent research suggests that the IPAQ differs from objectively measured PA and it is a questionable instrument to assess PA in patients with fibromyalgia[332]. Actually, the ALPHA questionnaire obtained slightly better associations with accelerometry than with the IPAQ.

In summary, the most important environmental issues associated with PA were walking and

cycling infrastructure and walking and cycling networks. The ALPHA environmental questionnaire might contribute to our knowledge of the determinants of PA among fibromyalgia patients. There is increasing evidence of a relationship between environmental factors with walking[37,333] and cycling[334] and general PA levels[105,335,336].

The mode of commuting scales and items showed a high reliability in both scales and items among fibromyalgia patients, regardless of the statistical index used. Previous test–retest reliability studies showed a high reliability in a similar mode of commuting to work questionnaire in healthy adults[337].

Moreover, in the current Study I, active commuting was significantly correlated with PA levels regardless of the measurement (objective and self-reported). In other way, active commuting was related to walking categories form the IPAQ and light, moderate and MVPA. Previous studies have already suggested that active commuting is associated with higher PA levels in healthy adults[18,47]. A perceived physical environment is associated with higher levels of walking behaviour[338,339], and as a result, actively commuting to work or to other routine destinations such as the shops might contribute to higher levels of PA and a better HRQoL[18]. Particularly in females, active commuting might be one of the few sources for practising PA[17]. The symptomatology of patients with fibromyalgia, mainly the pain, could be the main reason of the low levels in PA; consequently, active commuting might increase these levels on this special population and might be a starting point for including active behaviours in their daily routines.

Moreover, after analysing the correlations between active commuting and PA adjusting for the availability and maintenance of cycling and walking infrastructure, these significant correlations disappeared. Consequently, the quality of the infrastructure is a key role for increasing the PA levels among fibromyalgia people. It must be taken into account when planning future interventions to promote PA.

Study II: Associations between patterns of active commuting and socioeconomic factors in women with fibromyalgia: the al-Ándalus project (Study II).

Approximately, about 70% of the participants included in this study (both fibromyalgia and control groups) were active commuters in their daily life. Around 78% walked to local shops, 49% walked to supermarkets and 68% walked to local facilities. Comparing these result with a previous study[101] we found a higher percentage of active commuters in both fibromyalgia and healthy women. Healthy American adults who commute actively by walking mode ranged from 10% to 46% for different local facilities (i.e. recreation facilities, park, grocery store, fast-food restaurant and sit-down restaurant). However, we only found this study assessing commuting to similar destinations, which hampers further comparisons. A 36.2% of fibromyalgia and 23.5% of healthy women were active commuters to study/work place, which can be compared with previous studies. The results showed in the current study were lower than the 60% and 42% of commuters who walked to study/work place among Polish women[100] and English women[47]. However, our results are similar than the 30% and 36% of Australian adults[340] and healthy Polish women (only for women with fibromyalgia)[341]. The current study also showed slightly higher results than the 26% and 20% of active commuters to study/work place among English adults and American women[32,342,343]. However, these comparisons should be done cautiously because of the different participants in every study and the specific-context influence for active commuting. In the current study, all participants were women and commuting by walking has been shown to be more prevalent in women than in men[17,344].

Active commuting between fibromyalgia and control groups was different for younger and

older women. In the young group, the frequency of active commuters was similar between fibromyalgia and healthy women. In the older group, there was only one significant difference in the variable of worker commuters with higher percentage of active for the fibromyalgia group. It is likely that younger fibromyalgia patients might cope better with the symptomatology of this health condition than older patients. The control group aged ≥51 years reported a higher percentage of active commuting to local shops and to supermarket in the control group compared to the fibromyalgia group. The symptoms of fibromyalgia seem to be more apparent in older women, and these sufferings might avoid the capacity to walk as a way of commuting for the daily duties.

This is the first study assessing the relationship between socioeconomic factors and active commuting in women with fibromyalgia. Women with fibromyalgia who lived alone were more active commuters than those living accompanied, which is in agreement with a previous study where single women had more commuting activity than married or co-habiting women[100]. Additionally, men and women that lived alone had a higher prevalence of walking as transport than those living in-partner and those with young children in the household[101]. Likewise, participation in leisure time PA has been shown to be reduced in women with family demands[99]. Therefore, it seems that women with more family demands might have less time for practicing leisure time PA and, similarly, for commuting to their daily duties. For instance, using passive transport like cars might help women with fibromyalgia when they have to do duties in different places or simply family might overprotect them taking to their duties.

There was no association between educational level and pattern of active commuting. The relationship between educational level and active commuting is controversial since previous studies revealed that higher educational level was related with lower active commuting levels among Brazilian healthy adults[102] but with higher levels of active commuting among American healthy women[99]. Our results suggest that current occupational and professional statuses are not associated with active commuting behaviours in women with fibromyalgia. These findings disagree with studies conducted among American[99], English[32] and Polish healthy population[100] where they found higher levels of active commuting among people with lower socioeconomic status. These studies were focused on healthy participants and our results are focused on women with fibromyalgia. However, we obtained similar results when performing the same analysis with the control group, and we did not find any associations between active commuting and educational and professional levels.

The associations between active commuting and socioeconomic factors in women with fibromyalgia described in this study has a number of important implications for the development of public health policies to improve quality of life of these patients and, perhaps, to reduce health care cost. The prevalence of active commuting was similar in younger (<51 years old) fibromyalgia and healthy women. However, the prevalence of active commuting was lower in older (≥51 years old) women with fibromyalgia compared with healthy women. This implies that active commuting policies' in the general population could particularly be extended to older women with fibromyalgia. On the other hand, our findings suggest that women with fibromyalgia with family demands are less active commuters, so that strategies to improve these situations are needed. Policies focused on reducing family demands for fibromyalgia patients (i.e. social help on housework, childcare or overprotection) might facilitate the inclusion of daily active behaviours.

Study III: Is active commuting associated with sedentary behaviour and physical activity in women with fibromyalgia? The al-Ándalus project.

Concerning the commuting behaviour, about 69% were active commuters in their daily life. Additionally, between 47% and 76% of women with fibromyalgia commute actively to local shops, to supermarket and to local facilities, being these percentages for walking higher compared with the healthy young people when walking to similar destinations[38,101] and to work[27,47]. In spite of a previous study revealed that younger healthy adults aged 18-49 years reported being more active commuters than older counterparts aged ≥50 years[28], our findings only displayed a small difference between age groups in commuting to supermarket, being more active the older group.

In both young and older groups of patients, those who were active commuters spent less sedentary time, achieved more time in all PA levels (except light and vigorous PA levels in the older group) and walked more steps than those who were passive commuters. This means that active commuters, independently of their age group, are more physically active on their daily life than passive commuters. Recent studies support this fact among healthy adults in general and particularly in women, in which PA can be accrued throughout active commuting[18,31], predicting even PA levels later in life[18]. Nevertheless, it is necessary to highlight that the differences between active and passive commuting are larger for all PA outcomes in the younger compared with the differences found in the older group, suggesting that active commuting is not enough stimulus to produce changes on PA levels.

In Study I, it was found moderate correlations (r ~ 0.4) of active commuting with objectively measured moderate PA and MVPA, which allow us to suggest that there might be a relationship between the mode of commuting and PA in these patients. When the association between PA and active commuting was studied separately by age groups in women with fibromyalgia, PA was associated with mode of commuting in the younger group, but not in the older group. Sedentary time and total PA were associated with mode of commuting in young fibromyalgia women. The current result of an increase of around 30 min/day of total PA is in agreement with previous literature, in which studies found higher levels of overall PA in those healthy men and women (aged 36.3±11.7 years) who commute by active means[47], and also with the self-perception of PA assessed with the IPAQ, which was greater when women (aged 44.6 years) reported to commute actively[345]. Association between moderate and MVPA and active commuting found in the current study are supported by previous literature. Moderate and MVPA increased around 19 and 21 min/day, being according to previous literature in which walking for commuting to work has been associated with an increase 19 min/day of MVPA in healthy men and women[47], but more than the 9 min/day of additional MVPA found in healthy adults (aged between 20 and 79 years) who walked for commuting at least for 5 hours a week[7]. Moreover, active commuting for healthy women (aged 42.3±11.4 years) who spent 150 min or more per week in this behaviour was associated with an increase of around 9 min/day of MVPA[17]. Furthermore, step count was also positively associated with active commuting in the young group, increasing around 2,000 steps per day. For each 1,000 step incremented per day, benefits for fibromyalgia patients are evidenced in a reduction of the fibromyalgia impact[97]. This study estimated that patients with fibromyalgia who increase daily step counts would have a 30% improvement in self-report physical function and pain symptoms.

On the other hand, associations between active commuting with sedentary time, PA levels and steps did not appear for older women with fibromyalgia. Despite passive commuting increase the risk of insufficient total PA[346], the present results in the older group did not reveal

associations between mode of commuting and PA outcomes. The different results obtained for each age group regarding the association between active commuting with sedentary time and PA, might be explained by the mean differences between active and passive commuting for sedentary time and PA; mean differences that are higher in the younger group compared with the older group. In the same way in which family demands have been inversely associated with the commuting behaviour in women with fibromyalgia in the Study II, family demands might avoid other domains of PA such as leisure time PA. Higher possible differences in family demands in the younger group compared with the older group might draw these differences on PA outcomes. Moreover, homemakers accumulate PA during their domestic activities, while employed women are those who acquire more PA throughout active commuting[347]. Since age was inversely correlated with current occupational status (i.e. older women with fibromyalgia have lower employment than younger counterpart), PA differences between age groups might be produced. For these reason, while active commuting in young women with fibromyalgia is associated with higher rates of PA, active commuting in older women with fibromyalgia might not be enough stimulation for increasing PA.

Study IV: Active commuting is associated with impact of fibromyalgia, health related quality of life and fatigue: the al-Ándalus project.

The Study IV represents the first comprehensive characterization of the association between active commuting and fibromyalgia symptomatology in women with fibromyalgia. We found different results depending on the age group when the symptomatology was compared between active and passive commuters: active commuting might produce positive effects on fibromyalgia impact, HRQoL and fatigue only in young women with fibromyalgia. Thus, associations between active commuting and fibromyalgia symptoms vary with age, which might be yielded by symptoms differences across age[348–350]. Previous results in healthy adults found positive associations between active commuting and wellbeing[351], while less unsupervised walking in women with fibromyalgia was associated with a decrease of fatigue perception[96]. Taking a broader view, different previous studies, focused in patients with fibromyalgia, associated PA in general with a reduction on fibromyalgia impact and fatigue[91,97], being in line with the observed for active commuting in the young group in the current study. On the other hand, the positive effects of PA on pain modulation observed previously[88,89,91,97] were not found in the current study for active commuting behaviours. Therefore, there is a lack of studies that associate active commuting with symptoms in chronic pain or rheumatic patients, making difficult to understand if the obtained results are according to previous evidence or are produced by causality. Otherwise, active commuting showed similar results than PA for the symptomatology management except for pain modulation. This might suggest that active commuting interventions, as a source of PA, might produce similar benefits on symptomatology than the obtained with PA programs.

Overall, when comparisons between groups of combined age and mode of commuting are performed, young and active commuters' women with fibromyalgia showed better fibromyalgia impact and HRQoL than the young and passive group. However, the older and active commuter group showed similar symptomatology than the young and older passive groups. This difference between younger and older active commuters might be yielded by a decrease on PA by age. Despite active commuting remain stable after the 35 years approximately in healthy population[38], the PA decrease with age[24]; being women with fibromyalgia less physically active than healthy women[93]. Although both young and older active commuter groups usually commute by walking,

the duration or the intensity walking might be different. However, data about the duration and intensities for active commuting are lacking, and we cannot explain certainly the differences by age observed in the association between active commuting and symptoms. On the other hand, recent studies suggest that patient perceptions' about the negative effects of walking on symptomatology might avoid the inclusion of active commuting behaviours in their lifestyle[108,109]. Nevertheless, the current results did not display worse symptomatology for active commuters than passive commuters, independently from the age group. Therefore, active commuting is a behaviour which seems produce symptomatology benefits without adverse effects for women with fibromyalgia.

Although we cannot obviate the cross-sectional design of this study, the results obtained indicate some better symptomatology status in women with fibromyalgia who commute actively, being necessary to support this behaviour. Whereas active commuting strategies should be implemented in young women with fibromyalgia to chase health benefits, in older women with fibromyalgia other kinds of strategies (e.g. PA programs or unsupervised walking) might be more appropriate to get these health benefits. In the promotion of active commuting behaviours, different problems such as bad perceptions of the effect of walking on symptomatology[108,109] or difficulties to self-manage symptoms and the commuting behaviour[352] might appear. Thus, to overcome some of these anticipated negative consequences, support from their social environment (e.g. family, friends, health providers, and fibromyalgia associations) it is necessary[108]. The social nets of women with fibromyalgia might develop a key-role for the management of the illness, helping them to take part of activities and behaviours which have a direct effect in their symptomatology.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

The main findings of the Project II comprised in the current Doctoral Thesis suggest that V) the research questions used across studies were heterogeneous. More than half of the studies used an exact question about commuting to school, the most frequently used question referred to a recall period "usually" and for both trip directions (routes to and from school) and most of the studies used children/adolescent questionnaires. The results reported were most often percentages of modes of commuting to school and percentage of active commuting to school, meanwhile only a few studies used valid and reliable questions. Most of the studies were evaluated as being of medium reporting quality; VI) The Mode and Frequency of Commuting to and from School Questionnaire has shown a convergent validity among children and adolescents. The self-reported mode of commuting was positively associated with objectively measured PA in both children and adolescents. Moreover, the comparison of the self-reported time of the journeys compared with objectively measured time using Google Maps™ software was as accurate in adolescents as in children; VII) There were significant differences between the mode of commuting to and the mode of commuting from school in children (for walk and car) and also in adolescents (for walk, car and bus). Comparing the way to school with the way from school, there was a higher use of walking and bus modes and a lower use of car for the way back from school, compared to the way to school. Moreover, both usual and daily modes of commuting showed a common pattern: young people reporting a usual mode of commuting to and from school means that they commuted more than 7 journeys per week (regarding a maximum number of 10 journeys per week) using that same mode; VIII) Few associations were observed between weather conditions and mode of commuting to and from school. However, some associations between deviation

from usual mode and season and weather conditions were observed; IX) Commuting without adults´ supervision, perceived safety and use of active modes of commuting to school were more common among old children that young children. Associations between independent commuting to school and safety perception showed that middle and older children who actively commute alone perceived more safety than those who travel accompanied.

Study V: Assessing modes and frequency of commuting to school in youngsters: a systematic review.

Less than half the studies posed a direct question for assessing modes of commuting to school, very often, "How do you usually travel to school?" Most of the studies gave the answers to this question (i.e., by car, on foot, by bicycle) without reporting the frequency (i.e., 3 times per week by car). The combination of mode and frequency would of course provide fuller information and so compilers of these questionnaires should pose a complete and precise question and answers -concerning both mode and frequency- to guarantee an assessment that is both categorical (mode) and continuous (frequency) and facilitate replication and comparisons between studies.

The recall period usually was the most reported in the questionnaires. This question may well provide information about routine journeys to and from school, but it might not capture multimodal trips. Another recall period asked for was a specific day (yesterday, today). This may be more precise but might introduce a bias in the results by classifying a participant as active or passive on the basis of the mode used that day, which might be different from their usual mode of commuting to school. Other recall periods were a typical week or the past week. Questions with longer recall periods might be more difficult for young participants to complete.

The trip direction to school was asked for in more than half the studies. Presumably, some of the studies that only reported one of the trajectories might in fact have assessed both routes. Studies should indicate clearly in their methods section the routes they are measuring. Only one study assessed the correlation between the results going to and coming from school, reporting high correlations[322].

Most of the studies used a questionnaire for their self-report measure. In more than half the studies, children and adolescents completed the questionnaires independently. A couple studies showed that children's answers concur with those of their parents[51,235].

Percentage of commuting to school by mode was the most common outcome used, thus allowing researchers calculate percentages of active versus passive participants. This dichotomous variable occurs frequently in the scientific literature[353], although there is still no complete agreement on dichotomizing active versus passive. Public transport is classified as passive transport but children still need to walk to reach the bus stop[354,355]. There is evidence that commuters who use a car to travel to and from school show a lower $VO_{2\ max}$ than those who rely on other modes of commuting[255], but the distinction between active, passive or "mixed transport" commuters remains undecided[149]. Two review studies on active commuting to school concluded that a standard definition and measurement of commuting to school should be addressed in future studies[12,144].

Another type of result concerns the number of active or passive journeys per week (0–10 trips)[235]. The use of this continuous variable might allow us to run more suitable statistical analyses. The results might be interpreted in detailed terms of more active and less active participants instead of merely active versus passive. Moreover, the continuous variable may be categorized as a dichotomous variable, although there is still no consensus regarding

the cut-off point for dichotomizing active versus passive. A study from the USA on the program Walk To School used 3 active journeys per week as the cut-off point[356].

Validity and reliability are important issues[357–359]. In the current systematic review, only 33.0% of the studies indicated that the question used was valid, reliable or both. More efforts should be made to assess and report commuting to school with valid and reliable instruments. A standard question to assess commuting to school should be formulated in different languages and its validity and reliability should be addressed (i.e., comparing children´s reports about their mode of commuting to school with their parents' reports, a direct observation[144] or accelerometry[214,268] assays).

The majority of the studies identified were rated as being of medium reporting quality. Validity and reliability were the least reported items. The highest rating was reserved for the studies providing each of the identified items (Table 20), which is an important premise for the replication and comparison of studies in the literature. The items "validity" and "reliability" should always be indicated in the Methods or Results section.

Given this review of previous self-report methods used in the active travel to school literature, we put forward a standard form to allow comparability between studies. The assessment should afford the following characteristics: a complete and precise question and answer about commuting to school, asking about both trip direction to school and covering the whole school week (Monday to Friday). It should ask about both the mode (i.e., on foot, by bicycle, by car, by motorcycle, on the bus, and others) and the frequency for each mode. Students should fill in the questionnaire first thing every weekday morning with their teacher's help. At every morning session the students complete the mode used to go back home the previous day and the mode to school that morning. Doing so would provide the number of active and passive trips per week (from 0 to 10).

This method also lessens the risk of recall bias or incomplete questionnaires. The outcome of this questionnaire is a continuous variable regarding the number of journeys per week, which can be categorized in other values such as the number of active journeys per week, number of active journeys on the trip direction to school or a dichotomous active versus passive variable.

Study VI: Convergent validation of a questionnaire to assess the mode and frequency of commuting to and from school.

The Mode and Frequency of Commuting to and from School Questionnaire showed a convergent validity. The self-reported mode of walking was associated with a higher step number, less sedentary time and higher PA level in both children and adolescents. Walking participants achieved an average of 8% in children and 9% in adolescent from the 11,500 daily steps recommended for both children and adolescents in the scientific literature[360]. Consequently, young people who walk to and from school might due 1/5 of the daily recommended steps. Furthermore, walking participants spent more time in moderate and MVPA intensities levels than those who used passive modes of commuting. Nondifferences on vigorous PA might be due to the filtering process of ActiGraph (proprietary information) which lead to underestimate activity counts at high intensities[361,362]. Consequently, we might confirm that self-reporting the active commuting behaviour in this questionnaire showed a convergent validity, since it is highly associated with the PA measured using an objective tool. Similar questionnaires assessing the mode of commuting behaviour have been validated previously. However, these validation studies in children used questionnaires self-reported by parents as a gold standard measurement[50,51,235]. Additionally only one study was found which analysed the correlation

between self-reported active commuting and objectively measured PA when commuting to and from school and during leisure time in adolescents[49], reporting a lack of association. This result was contradictory to the Study VI and it might due to different issues: the characteristics of accelerometer models (i.e. 7164 accelerometer against GT1M, GT3X and GT3X+ accelerometers in the present study), the sample sizes and ages (i.e. 33 adolescents against 389 children and adolescents and different considerations of active commuting (i.e. walk and cycling, this second not properly comparable with accelerometry, against walk)).

The comparison between the self-reported and objective time while walking from home to school was quite similar for adolescents and different in children in this study. Both age groups tended to overestimate the time of commuting to go to school, although this overestimation was higher in children. Children reported a mean close to 4 minutes while adolescents reported a mean of 1.5 minutes. Additionally, student t-test confirmed there were significant differences in children, but not in adolescents. Two explanations to this result might be that children take more time to cover the same distance than adolescents and/or that children estimate times with less accuracy than adolescents. Both explanations are related to the lower age and development of children compared to adolescents. This inaccuracy on reporting the time taken from home to school in children could have an impact in the measurement, as a previous study suggested[57,363]; however, this inaccuracy does not seem to exist among adolescents[364]. Moreover, these results are supported by the 95% limits of agreement, which are quite similar in children and adolescents (35.15 and 33.24 minutes of difference between the upper and lower limit of agreement for children and adolescents respectively). Consequently, the self-reported measurement for the time of commuting seems to be comparable with Google Maps™ measurement in adolescents but not in children.

Study VII: Mode of commuting TO and FROM school: a similar or different pattern?

Results shows that there are significant differences between the mode of commuting to school and from school. Approximately 6% of the children and 3% of adolescents were more likely to commute on foot on the way home from school compared to the way to school and to commute by car on the way to school compared to the way from school. Consequently, there are some afternoon-only walkers that were likely to have been driven to school in the morning. This pattern has been observed in young people from Canada[155], Iran[308] and North America[259,310,165], reporting 8%, 6% and 4% respectively more walkers on the travel from school than on the travel to school. Moreover, the number of students driven from school in the current study was around 4% higher than those driven to school in Canadian[155] and around 50% lower than those from North American[310] young people. Actually, Larsen et al. (2012)[310] found that almost 60% of students reported that the driver of their vehicle was going somewhere else (besides home) after the drop off. Parent´s convenience to drive children to school has been previously reported as a main correlate on the mode of commuting to school[249,365]. Together with the lack of time in the morning time, could be another reason for explaining the difference on the mode of commuting to and from school regarding walk and car modes.

In the systematic review developed in the Study V, a number of studies from the scientific literature focused on the mode of commuting to school asking for both trip directions (i.e., go and back to school) but most of them only reported one of the trip directions in the results (i.e., go to school). It might indicate that, presumably, there were no differences between the commuting to school in the travel to versus the travel from school, although this information was not reported in several studies. Attending to the results obtained in the current study and in the literature, we recommend to

ask about both trip directions using the Mode and Frequency of Commuting to and from School Questionnaire, in order to identify a similar or different pattern on the mode of commuting to and from school and provide a more accurate measurement of this behaviour.

Regarding the difference between both usual and daily mode of commuting during a week, the results showed a consistent pattern on the mode of commuting to school and from school. Participants who reported a usual mode of commuting to school and from school commuted more than 7 journeys per week (of a maximum of 10 journeys per week) using a similar mode. Consequently, we may confirm that a usual mode of commuting means to use that mode around 8 or more times per week, regarding the participants from this study.

These results provide a further knowledge regarding the real meaning of usual among young people, which may be helpful for researchers in order to analyse what recall period to use when assessing the mode of commuting to/from school using a questionnaire.

There is previous evidence of merging two different recall periods on the mode of commuting to/from school in the same study[272,326]. Costa et al. (2012)[272] merged usual and previous day. They conducted a two school-based study carried in 2002 and 2007 with Brazilian children. In 2002, they asked for the main mode of transportation to school on a usual weekday. Later, authors knew a validation study that showed an improved recall of food consumption when children were asked to recall what they ate yesterday rather than what they usually eat[366]. For this reason, in 2007, children were asked to indicate the mode of transport used on the previous day rather than how they usually travelled to school. Asking about a specific moment (i.e., previous day) seems to be more valid but maybe it might differ from the usual behaviour. In the second study, Bere et al. (2011)[326] merged the recall periods of a week and usually, the same that have been examined in the current study. They used a study focused on Dutch adolescents and another on Norwegians adolescents. In the first one, it was asked how many days of the week (0 to 5) they travelled to school walking, cycling, or by public transport or car. Those cycling three days/week or more to school were categorized as cyclists. In the second study it was asked by "what mode of transportation do you usually go to school?" and response alternatives were bus, car, walking, cycling, rollerblades and scooter. In this case, adolescents who reported cycling to school were categorized as cyclists. These authors used the number of 3 or more week journeys to school (in the first study focused on Dutch) to identify it as a usual mode (using in the second study focused on Norwegians) for cyclists. In the current study, we identified 4.5 or more week journeys (out of 5) to or from school as a usual mode, regardless of the mode of commuting.

Consequently, it is of interest to analyse what participants understand for a usual mode of commuting to and from school. It will help researchers to choose the appropriate recall period for assessing mode of commuting to/from school and to allow comparisons between studies with different recall periods (i.e., such as weekly and usual).

This study has provided practice implications for stakeholders and governments in order to set an appropriate assessment of the patterns on the mode of commuting to school. This accurate assessment will economize efforts, time and money when implementing successfully strategies with the aims of reducing motorized modes and increasing active modes of commuting to school. The results provided in the current study contribute to conduct accurate surveys about the mode of commuting within the population.

Initiatives and programs to increase active commuting to school rates are becoming more numerous in recent years. There are no still

conclusive results about the effectiveness of these interventions and, moreover, there is no standard for measuring the prevalence of active commuting. This lack of common metrics limits opportunities for inter-studies comparisons. The Study VII provides information on how to assess and analyse active school commuting. The quality and accurateness of these measurements will allow setting effective conclusions in order to formulate appropriate public health policies within schools. Measurements should be implemented by school personnel to assess rates of active commuting to school every year and how it changes longitudinally, in order to create healthy school environments. The most feasible measurement to use is this questionnaire, which has been designed and tested in school settings. It is essential to ask students about the journeys to and from school when assessing the mode of commuting to and from school behaviour, since it has been evidenced a different behaviour between these two directions. Moreover, it is suggested asking only for the usual mode of commuting, since it has showed a high consistency with the daily mode of commuting reported during a full week.

Study VIII: Longitudinal associations between weather, season, and mode of commuting to school amongst Spanish youth.

Descriptive results suggested that seasons and weather conditions might have an impact on the mode of commuting to school, since there were significant differences in these variables between active and passive journeys. For this reason, it was important to know the effect of specific weather conditions during school hours (including time for commuting) on the choice of school travel mode. We found bivariate associations between weather conditions and active commuting to school, although most of these associations disappeared in multilevel logistic regression models.

Active commuting to school was associated with higher mean temperatures in adolescents, but only on the way from school. A previous study reported associations between temperature and active commuting to school[158] in children. Higher total precipitation was associated with active commuting to school choice in children, a surprising finding given the associations previously seen between rainfall and PA in general[367–371]. Although, positive associations have been reported between active commuting to school and precipitation in adolescents[159], we found no association. Some studies from the last decade support the idea that weather conditions do not have any impact on the mode of commuting to school[161–164]. The lack of a wide and consistent impact in the current study might be explained by the specific climate of the schools' location (i.e. Semiarid and Mediterranean continental climates), a climate without extreme fluctuations during the year, which allows the creation of strong routine behaviour. We may speculate, following the results of Mitra and Faulkner (2012) in Canadian children[160], and Robertson-Wilson et al. (2008) in Canadian adolescents[162], that a specific weather conditions should not be an actual barrier to active commuting to school in children and adolescents from the south of Spain.

Concerning seasonal associations, children were less likely to choose an active mode of commuting for going to school in winter while adolescents were more likely to choose an active mode of commuting for going to school in spring. Nevertheless, there was no association for the return journey from school, which could indicate that seasons might have an effect on the choice of the mode of commuting for going to school, but not for commuting from school. The seasonal variations in the choice of mode of commuting to school are consistent with previous findings; children and adolescents were more sensitive to seasonality, with higher percentages of active commuting in warm seasons[219,372,373]. However, other studies supported the idea that seasonal climate did not appear influencing on the choice of mode of commuting from school[160,162]. In the current

study, active commuting to school was associated with more pleasant seasons such as autumn and spring compared to winter time. However, seasonality shows different characteristics in every geographical context, and there are not conclusive results in the scientific literature regarding the influence of the season on the mode of commuting to school in youth.

Regarding the effect of weather conditions and season among the usual mode of commuting to school, our results suggest some deviation from usual behaviour as previous studies propose[52,373]. Children who reported being usually passive were more likely to become active commuters in spring. Adolescents, who reported being usually passive were more likely to become active commuters with higher mean temperature, higher mean wind speed and in autumn, compared with winter. These results suggest that among those who are usually passive, warmer weather conditions may produce a change from passive behavior to active commuting to school. Faulkner et al. (2010) found that parents of children who are usually active choose a passive mode when they perceived worse weather and those who are usually passive choose an active mode when they perceived better weather[374]. These results, coupled with our own, highlight the importance for working with both parents and young people in intervention programs to reduce the impact of the weather conditions; helping active commuters stay active in worse weather, and encouraging those who are usually passive to be active in better weather.

The most conclusive result observed was that all participants (i.e. usually active and usually passive commuters, children and adolescents) were more likely to use active modes of commuting on the way back from school than on the way to school. Parents' convenience might be the main factor associated with changes in the mode of commuting to and coming from school[249]. Additionally to this main factor, differences between weather conditions during the afternoon compared to the morning might prompt children and adolescents change to modes of commuting when coming back from school. These observation are important when planning interventions to promote active commuting to school.

The associations between weather and season and active commuting to school were more evident in adolescents than in children. These differences might be explained because children have less say on their mode of commuting than adolescents[110,374]. Children's mode of commuting to and from school is usually a parents' decision, and parents' perceptions are a strong determinant on their children's mode of commuting[52,135]. Other determinants such as distance[56], safety[130] or neighbourhood[375] might be more important than weather conditions in that choice. Independence in the decision on mode of commuting increases in adolescents because independent mobility increases with age[130]. Adolescents make a decision about the mode of commuting to school taking into account the distance, safety or weather factors. Accordingly, Simons et al. (2013) conclude that weather (as well as travel time, autonomy and social support among others) is a determinant in the decision on mode of commuting in older adolescents[159].

Study IX: Active commuting to school: a daily opportunity to improve children's independent mobility.

Descriptive results suggested that the accompaniment mode, children safety perception and mode of commuting changes regarding the children age. For this reason, is important to know how accompaniment and safety perceptions (determinants for mode of commuting to school) change in order to develop appropriate strategies to increase the autonomy among children. The findings in the Study IX displayed higher percentage of active commuting in middle and old children (around 60% vs. 47% in young children). In children with the same age (i.e. from 6 to 11 years), most

of the research evidence found lower percentages (i.e. between 18% to 49%) of active commuting patterns in England[55,156], Portugal[376], Ireland[301], New Zealand[121], United States[52,168,377] and Canada[247]; while other found higher rates (i.e. between 76% to 90%) of active commuting in Switzerland[124] and Norway[304]; and only two studies in Belgium[149] and China[167] found similar percentages to the obtained in the current study for active commuting. Despite of studies reporting percentage of active commuting to school in Spanish children are lacking, Spanish adolescents showed similar percentages of active commuting than the obtained in this study in older children[243,298]. Moreover, children increase their safety perception up to 41% and 62% in middle and old children respectively (vs. 10% in young children). Regarding accompaniment mode, children increase their independent mobility up to 26% in old children (vs. 3% in young children and 10% in middle children). Descriptive results obtained allow us to set that the independent´s and active mobility should be encouraged among middle and old children.

Analysing only children who commute actively to school, older children were more likely to commute to school independently, which is according to recent studies[130,131]. The obtained result were similar to the 3% of Canadian aged 6-9 years[131] and 21% of Portuguese aged 8-15 years who commute actively and independently to school[378], while other studies displayed a higher percentage (between 28% to 44%) of independent active commuting in children aged 10-12 years from Canada[131] and Australia[171]. Combining these findings on independent mobility with the current results, which showed similar percentage of independent active commuting in middle and old children, strategies to increase independent mobility to school might start in middle children (i.e. 8-9 years) but should be promoted in old children (i.e. 10-11 years), because in these ages parents seem to allow to their children to commute actively to school, and in a second place to commute independently, while children might accept and include that behaviour in their routine. For example, a strategy to increase the independent mobility, and consequently autonomy, is to provide the opportunity of choice to the child between active modes[171,379]. For that reason, permission to choice the mode of commuting between 8-9 years might increase the active commuting to school, that in following years could be turned into independent mobility to school, and thus, in autonomy.

However, working on independent mobility could be difficult if barriers appear. Regarding safety perception, independent mobility has been previous explained throughout objective descriptors about the traffic environment assessed subjectively, regardless the parents' experience of how safe the route to school is[373]. Once parents' perception about the route to commuting to school is improved towards a safety perception, permission to choice the mode of commuting might appear. Being the children who have to choice the mode of commuting to school as we suggested before, children's safety perception might avoid this behaviour. Results in the current study displayed that older children reported a higher percentage of safety perception. Additionally, among middle and old children who commute actively to school, those who commute independently are more likely to perceive safety than those who commute to school accompanied with an adult. This could mean that children developed their safety perception while commute accompanied to school, and later this perception could be improved when commute independently to school. Conversely, parents' perceptions about safety are heightened when parents accompanied their children[131]. For these reasons, strategies for improving the safety perception should be implemented in both parents and children, to develop a framework for supporting the autonomy[380]. Some examples of these activities might be knowing children's motivations about how to commute to school, allowing and countenancing the mode of commuting to

school chosen and solving parents and children together the problems about safety that appear on the route to school.

Interventions to promote independent commuting to school are heterogeneous but are effective with appropriate school, parent and community involvement[353]. Panter et al.[57] proposed a framework which contains four main domains of influence on active commuting behaviour: main moderators, physical environmental factors, individual factors and external factors. Main moderators (e.g. age or gender) are not modifiable, and physical environmental factors are ease to improve only with programs in which investments for infrastructure are included in the program, such as "Safe Routes to School"[165]. Consequently, individual factors and external factors are the most likely to influence on the mode of commuting choice[57]. Autonomy and perceptions of parents and children are included as individual factors while some external factors are weather or Government policy. Research that develop interventions to increase independent mobility should involve children, parents, schools and community, focusing on individual factors such as raise the safety perception of the route in both children and parents, and reducing the negative effects of external factors such as weather (e.g. encouraging the use of appropriates clothes). An example of intervention was developed by Villa-González et al.[122], in which they worked mainly with individual factors in children and parents, supported by the local government and also working with schools and teachers. Nevertheless, only individual factors (e.g. autonomy or safety perceptions) were included, and intervention programs to reduce the effect of external factors are needed.

LIMITATIONS AND STRENGTHS

Nirvana
Nevermind (1991)
Come as you are

LIMITATIONS AND STRENGTHS

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV).

Study I: It is noteworthy that the ALPHA questionnaire was developed to measure the perceived environment among healthy people and thus any comparisons between our study and previous studies should be drawn with caution. In addition, Cronbach's alpha has a limited usefulness because the environmental scales are often formative and not reflective by nature. The main strength of the current study was the use of accelerometry as an objective measurement of PA.

Study II: Firstly, its cross-sectional design does not allow establishing causal relationships. Second, the sample might be strongly influenced by their context and this study should be replicated in different contexts. Finally, the fibromyalgia group was only comprised of women, and further research among men with fibromyalgia is warranted. By contrast, the relatively large sample size and the standardized protocol are strengths of the current study. Furthermore, to our knowledge, this is a very first study analysing the relationship between socioeconomic factors and active commuting among women with fibromyalgia. Additionally, this study describes active commuting behaviours to other different destinations than the common study/work place, such as local shops, supermarket and local facilities.

Study III: The cross-sectional design does not allow establishing causal relationships and study sample only comprised women and further research among men with fibromyalgia is warranted. Finally, the low sample size who commute to work or study place does not allow us to study the association of this behaviour with PA. The main strength of the Study III was the relatively large sample size. Moreover, the measurement of PA throughout accelerometry is another strength, since self-reports of PA lead to misleading information in this population[332,381].

Study IV: The cross-sectional design of the current study does not allow establishing causal relationships. It seems plausible that active commuting might reduce some fibromyalgia symptoms, being equally possible that symptomatology status have an effect in the commuting behaviour. Additionally, in spite of the reliability demonstrated for the commuting questionnaire, its validity is still unknown. Other limitation is the lack of data about the duration of commuting, which might be essential to understand the relations between this behaviour and fibromyalgia's symptoms. For example, older women who commute actively might spent less time for commuting than younger counterpart who commute actively, being not enough stimulus for the older women with fibromyalgia to establish associations with better symptomatology. Further, we do not know whether these findings apply to men. A strength of the current study was the assessment of a relatively large sample size of women with fibromyalgia and our efforts to recruit a representative sample from southern Spain[65]. Moreover, to the best of our knowledge, this is the first study that associates a specific PA domain such as active commuting with the symptomatology of fibromyalgia patients.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

Study V: We may still have missed some relevant evidence due to poor indexing in some databases or indexing in databases not selected for the review process. Finally, the lack of assessing of the quality of evidence is other limitation. In addition, we found some weakness of the available evidence. One limitation is the relative scarcity of methodological details reported in studies, including, for example, the "commuting to

school" answer or the trajectories to and from school. Other limitation is that self-reported travel modes may be subject to social desirability bias, especially in the context of intervention studies. In addition, there is a lack of criterion measure against which self-reported commuting could be compared especially when children cycling (i.e., accelerometers). On the other hand, to our knowledge this is the first systematic review of self-reported methods focused on assessing modes of commuting to school used by school-aged children and adolescents from 4 to 18.5 years. The large number of studies included in our review (n = 159) also allowed us to draw broad conclusions which resulted in our recommendations for a standard self-report method.

Study VI: The main limitation is that 30 minutes before and after the starting and finishing time of the school was selected as the commuting time to obtain the accelerometer data, since more than 80% of the participants reported less than this time. However, it might not be the real time of commuting for every participant and other type of activities might be included within this period. Furthermore, a limitation is the use of three types of accelerometers (i.e., GT1M, GT3X and GT3X+); however, it has been demonstrated to be comparable under laboratory or controlled conditions[201,382], but not in a free-living environment[201,383–385]. Additionally, the use of Google Map™ to obtain the objective commuting time by walking between home and school may not fully correspond to the real commuting time, since children may not choose the shortest walking route suggested by Google Maps™. However, a previous study estimated a similar distance between the use of Geographical Information Systems and Global Positioning System -which use the real commuting route-[386], and a second and more recent study reported a high correlation between Google Maps™ and Geographical Information Systems (i.e., using as a gold standard)[60]. Other limitations are the sample reductiond-Altman analyses in order to get more accurate measurement, and the fact of using different types of accelerometers to assess PA. To the best of our knowledge, this is the first study that have examined the convergent validity of a questionnaire about the commuting behaviour using objectively measured PA and objective time from home to school. Furthermore, to study the convergent validity in both children and adolescents is another strength.

Study VII: Limitations include the convenience selection of the participants: the sample is limited in the representation of Spanish youth from the Southeast. However, the size of it contains a wide range of cases. The use of the questionnaire to assess mode of commuting to school, which has not been proven its validity and reliability yet is another limitation, but the questions containing it are very similar to other questionnaires on children's commuting to school that have demonstrated acceptable validity in youth. Another limitation is the use of a self-reported measure without including objective data to be able to compare with. However, the purpose of the study focused on a questionnaire. The main strength of the work is the novelty analysis in order to have a better understanding of the questions used for assessing mode of commuting to and from school.

Study VIII: The weather variation within the sample is somewhat limited, since participants come from a similar and proximal geographical area, so our results may not be generalizable to settings with different weather conditions. Although our repeated measures study design is stronger than the cross-sectional methods often used, we cannot determine a causality in the association we observed and the large number of tests undertaken means that some associations observed may be due to chance. Although we were able to consider distance from home to school, a key determinant on travel mode choice, we did not have information on parental mode, which may be important for children's commuting behaviour. The main strengths of the work are the inclusion

of a large sample of journeys that allowed us to examine in detail the associations between mode of commuting and weather variables via multilevel analyses. Our data was recorded at the journey level allowing us to explore changes in behaviour within individuals. We were able to study weather conditions during school hours which are a more temporally specific measure of exposure than is usual in this type of study. Furthermore, weather data were objectively collected by the Spanish Meteorological State Agency while in some other studies it was parents or research assistants who collected these data[387], being less objective. However, weather conditions recorded at the meteorological station may not be those actually experienced by the participants.

Study IX: Firstly, its cross-sectional design does not allow establishing causal relationships, and also, the use of the questionnaire in which its validity and reliability should be analysed. The lack of socioeconomic data of the sample is another limitation, because of its association with mode of commuting to school. By contrast, the main strengths of the work are to consider children's perceptions about safety concerns on the commuting to school and the inclusion of data from all grades of Primary Education, which allow us to understand the trend.

FUTURE RESEARCH DIRECTIONS

Queen
Innuendo (1991)
The show must go on

FUTURE RESEARCH DIRECTIONS

The results of the Project I suggest that young women with fibromyalgia who has family demands and who spend more time in sedentary activities showed a limited active commuter behaviour. The implications for the development of strategies to increase active commuting rates among young women with fibromyalgia acquire more importance due to the associations between this behaviour and better symptomatology status. These result are not applicable to older women with fibromyalgia. Therefore, it is necessary to support this behaviour, implementing active commuting strategies in young women with fibromyalgia and also other kinds of strategies (e.g. PA programs or unsupervised walking) in older women with fibromyalgia to obtain health benefits and to reduce health care cost.

Women with fibromyalgia should take part in public health strategies focused in active commuting behaviour, specifically designed for them or for the general population. Future prospective research should be focused in the development of these strategies in which the reduction of family demands for fibromyalgia patients (i.e. social help on housework, childcare or overprotection) are reduced. To facilitate the inclusion of daily active behaviours reducing these demands, strategies should be designed involving to their social environment (e.g. family, friends, health providers, and fibromyalgia associations). Beside the positive effect that social nets might develop for the management of the symptoms in women with fibromyalgia, facilitating tools to reduce housework from all the social environment statements are needed to combine with tools designed to encourage active commuting. Simplifying the family demands and encouraging healthy commuting behaviours might allow to women with fibromyalgia to commute actively to their local destination and also, for older women, to take part in unsupervised walking as a source of PA.

Additionally, walking is not as easy in women with fibromyalgia as we can expect. They have shown to walk slower and compromised gait parameters (such as velocity, cadence, stride length, etc.) compared with healthy women. Therefore, to analyse the relationships between gait parameters and active commuting behaviours it is necessary to understand the possible positive effects that this behaviour might produce regarding walking. Moreover, the intensity of walking might be different among women with fibromyalgia, producing less benefits in those who walking with lower intensities. To develop a measurement protocol to know the intensity of the walking behavior it is necessary for future research.

Results of the Project II suggest that the Mode and Frequency of Commuting to and from School Questionnaire (see annexe 12) is an appropriate tool to assess the commuting to school behaviour, allowing comparison between studies. The questionnaire cover information about both trip directions, usual and daily behaviour and ask about both the mode and frequency. Moreover, its validity has been demonstrated and psychometrics properties (i.e. it is compulsory to ask for both trip directions and you can choose to ask only for the usual or the daily behaviour based in the study purpose). However, information about its reliability is lacking and our research group are currently working on it.

Furthermore, throughout the Mode and Frequency of Commuting to and from School Questionnaire it is no possible to know an objective PA intensity and duration. Thus, it is important to develop a protocol in which these variables can be assessed beside the mode and frequency of commuting behaviour. The development and implementation of protocols which use accelerometers and global position systems to measure intensity and duration of the behaviour should be proposed in futures research, taking in account the difficulty that implies this kind of methodologies in studies with large populations.

Finally, when intervention strategies are implemented, weather conditions should be considered in order to achieve successful interventions which increase the effectiveness. Furthermore, focusing on developing safety perceptions and independent mobility might produce better improvements. In this way, following the framework proposed by Panter et al.[57], throughout the intervention strategy we can take into account the four main domain proposed (i.e. main moderators, physical environmental factors, individual factors and external factors), developing a more successful intervention. The *PACO project "Pedalea y Anda al COlegio": retrospective analysis of commuting to school in Spain and implementation of interventions to promote active commuting among young people*, is a promising study based on the findings exposed in the current Doctoral Thesis. Pretends to cover these future proposal building valid and reliable tools and developing effective school-based interventions targeting both children and parents to promote active modes of commuting to school.

CONCLUSIONES

Linking Park
Hybrid Theory (2000)
My December

CONCLUSIONES

Los resultados de esta Tesis Doctoral sugieren que:

Proyecto I: Desplazamiento activo en mujeres con fibromialgia – El proyecto al-Ándalus (estudios I a IV)

Estudio I: La versión Española del cuestionario ambiental ALPHA es un instrumento fiable para evaluar la percepción del vecindario por mujeres con fibromialgia. Además, el cuestionario de modo de desplazamiento es una herramienta fiable para evaluar este comportamiento. Existe una ligera asociación entre el cuestionario ambiental ALPHA y la actividad física medida subjetiva y objetivamente.

Estudio II: Mujeres con fibromialgia y sanas tienen patrones similares de desplazamiento activo cuando ellas tienen <51 años y se encontraron algunas diferencias cuando ellas tienen ≥51 años, con mayores porcentajes de desplazamiento activo para las mujeres jóvenes. Además, las demandas familiares están inversamente asociadas con los patrones de desplazamiento activo en mujeres con fibromialgia.

Estudio III: Las mujeres con fibromialgia que se desplazan activamente son menos sedentarias y se involucran en más comportamientos físicamente activos que aquellas que se desplazan pasivamente. Adicionalmente, el tiempo sedentario, la actividad física moderada, la actividad física moderada a vigorosa, la actividad física total y los pasos están asociados con el desplazamiento activo en mujeres jóvenes (<51y) con fibromialgia pero no en mujeres mayores (≥51y) con fibromialgia.

Estudio IV: Mujeres jóvenes con fibromialgia que se desplazan activamente presentan mejor sintomatología en relación al impacto de la fibromialgia, salud relacionada con la calidad de vida y fatiga, que mujeres con fibromialgia mayores y/o pasivas. Los posibles efectos positivos del desplazamiento activo sobre los síntomas de la fibromialgia podrían reducirse con la edad. Los programas de actividad física para mujeres con fibromialgia centrados en reducir los efectos de la sintomatología y mejorar su salud, deben tener en cuenta el desplazamiento activo para incrementar los beneficios físicos.

Proyecto II: Desplazamiento activo en jóvenes sanos – el Proyecto PACO (Pedalea y Anda al Cole) (estudios V a IX).

Estudio V: La información de medidas auto-reportadas para el desplazamiento hacia y desde el colegio es heterogénea y pocos estudios presentan preguntas fiables y válidas. En general, se observa una calidad media en el reporte de las medidas auto-reportadas. La heterogeneidad y la falta de información reportando las medidas de desplazamiento al colegio hace difícil realizar comparaciones entre estudios y entre los resultados de modo de desplazamiento, como la composición corporal, riesgo metabólico o niveles de condición física. Esto, a su vez, impide que se saquen conclusiones firmes e imposibilita la implementación de estrategias efectivas para aumentar la proporción de desplazamiento activo al colegio entre la población joven.

Estudio VI: El cuestionario de modo y frecuencia de desplazamiento hacia y desde el colegio muestra una validez convergente como herramienta para evaluar este comportamiento en niños y adolescentes españoles. Además, el tiempo auto-reportado de caminar desde casa

hacia el colegio es comparable con el indicado en Google Maps™ en adolescentes pero no en niños.

Estudio VII: Para evaluar el modo de desplazamiento se recomienda incluir ambas direcciones del trayecto (p.e. hacia y desde el colegio) y solo utilizar el modo usual. El modo usual de desplazamiento proporciona información similar al número de viajes diarios en la pasada semana; además es más simple y rápido para responder por los participantes y de implementar y analizar por los investigadores.

Estudio VIII: Se encuentran pocas asociaciones entre las condiciones climáticas y el modo de desplazamiento hacia y desde el colegio. Condiciones climáticas específicas como temperaturas medias más altas y estaciones más calurosas presentan asociaciones positivas con el desplazamiento activo a la escuela diario. Además, algunas desviaciones del modo usual se asocian con las condiciones climáticas, específicamente incrementaron la ventaja de desplazarse activamente entre adolescentes que se desplazan usualmente de forma pasiva con climatología más cálida, y entre niños que se desplazan usualmente de forma pasiva en primavera.

Estudio IX: Niños españoles (6-11 años) incrementaron el porcentaje de desplazamientos independientes al colegio, percepción de seguridad y desplazamiento activo al colegio con la edad. Además, entre niños que se desplazan activamente al colegio, los mayores indican un mayor porcentaje de desplazamiento independiente al colegio que los jóvenes. Finalmente, en niños que se desplazan de forma activa al colegio, los desplazamientos independientes al colegio se asocian con la percepción de seguridad.

CONCLUSIONS

Snow Patrol
Fallen Empires (2011)
In the end

CONCLUSIONS

The results of the current Doctoral Thesis suggest that:

Project I: Active commuting in women with fibromyalgia - The al-Ándalus project (studies I to IV)

Study I: The Spanish version of the ALPHA environmental questionnaire is a reliable instrument for assessing the perception of their neighbourhood environment by female fibromyalgia sufferers. Additionally, the mode of commuting questionnaire is a reliable tool to assess this behaviour. There was a weak association between the ALPHA environmental questionnaire with both self-reported and objectively measured PA.

Study II: Fibromyalgia and healthy women have similar patterns of active commuting when they are <51 years old and there were some differences when they are ≥51 years old, with higher percentages of active commuting for the healthy women. Additionally, family demands are inversely associated with commuting patterns in women with fibromyalgia.

Study III: Women with fibromyalgia who commute by active means spend less sedentary time and are involved in greater PA behaviours than those who commute passively. Additionally, sedentary time, moderate PA, MVPA, total PA and step count are associated with active commuting in young (<51y) women with fibromyalgia but not in older women with fibromyalgia (≥51y).

Study IV: We conclude that young women with fibromyalgia who commute actively presents better symptomatology for fibromyalgia impact, HRQoL and fatigue, than older and/or passive commuter counterpart. The possible positive effect of active commuting on fibromyalgia symptoms might be reduced by age. The PA programs for women with fibromyalgia focused on reducing symptom effects and improve their health, should be taken into account active commuting behaviours to increase the physical benefits.

Project II: Active commuting in healthy young people - The PACO project (Pedalea y Anda al Cole) (studies V to IX).

Study V: The reporting of self-report measures for commuting to and from school was heterogeneous and only a few studies presented a reliable and valid question. Overall, there was medium quality reporting of the self-report measure. The heterogeneity and incomplete reporting of the commuting to school measure makes comparison between studies and between behaviour and health outcomes, such as body composition, metabolic risk factors or fitness levels, difficult. This in turn prevents firm conclusions being drawn and inhibits the implementation of effective strategies to increase the rate of active commuting to school among the young population.

Study VI: The Mode and Frequency of Commuting to and from School Questionnaire shows a convergent validity as tool to assess this behaviour in Spanish children and adolescents. Moreover, the self-reported time of walking from home to school is comparable with Google Maps™ in adolescents but not in children.

Study VII: To assess the mode of commuting is recommended to include both trip directions (i.e., to and from school) and only the usual mode. The usual mode of commuting provides consistent information with the number of daily journeys in the last week; moreover, it is

simpler and quicker for participants to answer and for researchers to implement and analyse.

Study VIII: Few associations were observed between weather conditions and mode of commuting to and from school. Specific weather conditions such as higher mean temperatures and warmer seasons had positive association with the daily active commuting to school. Additionally, some deviations from the usual mode were associated with weather conditions, specifically increased odds of active travel among usually passive travelling adolescents in warmer weather, and among passively travelling children in spring.

Study XI: Children from Spain (aged 6-11 years) increased the percentage of independent commuting to school, safety perception and active commuting to school with the age. Moreover, among children who commute actively to school, those who were older reported a higher percentage of independent commuting to school than younger counterparts. Finally, in children who commute actively to school, independent commuting to school was associated with safety perception.

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Måns Zelmerlöw
Heroes (2015)
Heroes

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AGRADECIMIENTOS (Acknowledgements)

Billy Boy
The Last Goodbye (2014)
The last goodbye

AGRADECIMIENTOS (Acknowledgements)

En este momento de mi vida y carrera profesional, los jóvenes que acaban de terminar sus estudios de Grado y se están iniciando en estudios de Postgrado, me hacen preguntas como "*¿es duro hacer una Tesis*?" "*¿cuánto tiempo se necesita*?" "*¿te quita mucho tiempo personal*?"…, pero la más repetida es "*¿merece la pena hacer una Tesis Doctoral*?" A estas preguntas suelo contestar, "*puede ser duro hacer la tesis, ya que hay que aprender aspectos metodológicos, técnicas estadísticas y realizar trabajo de campo, para lo que se necesita de mucho tiempo de trabajo que se resta a la familia y a tu tiempo de ocio*" (cualquiera estará de acuerdo conmigo que el domingo es el mejor día para trabajar). Y como se suele decir, las cosas importantes siempre vienen después del "pero", así que continúo diciendo, "*pero te puedes organizar tu tiempo de forma que crezcas profesional y personalmente, aprovechar oportunidades que sería muy difícil tener si no te involucras en esta aventura, y sobre todo nunca trabajas solo. Siempre tienes un grupo de compañeros/amigos que te aportarán mucho más de lo que tú puedes esperar*." Por tanto, existe un grupo humano que es el principal causante de que mi respuesta sea siempre que si merece la pena meterse en este embrollo, al cual tengo que agradecer que me complicaran tanto la vida. Este viaje inesperado han sido los mejores años de mi vida.

En primer lugar, me gustaría agradecer al Ministerio de Educación, Cultura y Deporte por concederme una de las becas FPU de la convocatoria de 2013, gracias a la cual he podido desarrollar esta Tesis Doctoral. También quiero agradecer a la Universidad de Granada y a la Facultad de Ciencias del Deporte, que no solo me han acogido, sino que me han brindado una serie de equipamientos, personal y servicios para que el proceso de desarrollo de esta Tesis Doctoral sea más sencillo. Asimismo, agradecer al Departamento de Educación Física y Deportiva toda la iniciativa que ha tenido, tiene y seguro que tendrá en la formación de los estudiantes de doctorado que forman parte del mismo, haciéndonos sentir uno más dentro de esa gran familia. Quisiera también agradecer al grupo de investigación "formación y actualización del profesor-entrenador deportivo" (HUM - 161) que me acogió en mis inicios, y al grupo de investigación "**PROFITH** - PRomotion of FITness and Health through physical activity" (CTS-977), que nació durante esta aventura, y que se ha convertido en mi gran familia.

No encuentro palabras suficientes que hagan honor al tremendo agradecimiento que me suscitan **Palma** y **Jonatan** como mis directores de Tesis. No es posible imaginar el esfuerzo que realizan diariamente para darte mucho más de lo que significa esta Tesis Doctoral. Te mantienen alerta y te hacen consciente de tu propia formación, siempre pensando en tu siguiente paso, te enseñan "culturilla", incluso te mandan como deberes para casa que descanses, pasando de ser unos meros directores a amigos que te mentorizan. Estoy seguro que ellos lo han dado todo, porque sin duda me han hecho mejor persona.

Y estos últimos años de mi vida empezaron en la asignatura de "Métodos" de 5º de la Licenciatura de Ciencias de la Actividad Física y del Deporte, cuando tras presentarse **Palma** como nuestra profesora del grupo teórico, e indicarnos que teníamos que hacer como trabajo una investigación, le propuse que quería hacer una revisión sistemática…, y no dudó en empezar a guiarme hasta hoy. Son muchas las horas que hemos pasado escribiéndonos mails (incluso desde teclados chinos), revisando comentarios, reunidos de sol a sol (eso sí con reuniones activas), viajando,… pero dónde más hemos aprendido ha sido cuando hemos cerrado el tiempo de trabajo, y te has abierto a mi contándome tus experiencias y viajes, así como escuchándome siempre con gran interés y acompañándome en los momentos más importantes para mí. Después de todo el esfuerzo y tiempo que nos llevó la concesión del

Proyecto PACO, mi mayor satisfacción fue ver la alegría e ilusión que irradiabas porque gracias a ese proyecto los jóvenes podían tener una base sobre la que seguir formándose. Sobre una persona que te da todo lo que tiene pensando únicamente en lo demás, solo puedo decir que me siento orgulloso de afirmar que **Palma** ha sido mi compañera y guía durante este viaje.

Imagen 8. Celebración de la concesión del Proyecto PACO.

En paralelo, **Jonatan** se involucró desde el primer momento para continuar complementando mi formación (tanto académica como personal). Me brindaste la posibilidad de tener mi primer contrato relacionado con la investigación y siempre has estado ahí cuando te lo he pedido. Constantemente hilando fino y con perspectiva de futuro, has conseguido que cambie mi mentalidad sobre lo que puedo llegar a dar de mí. Igualmente, has sido el espejo en el que me he mirado para saber compaginar todo este proceso formativo con mi vida personal. Aprendí a que cada momento que pasábamos juntos me enseñabas algo nuevo, así que lamento cada instante que no hemos podido compartir. Ojalá todo el mundo pudiera tener personas como vosotros arropándoles como vosotros lo habéis hecho conmigo.

Es una pena que solo pueda decir oficialmente que tuve dos directores de Tesis. A lo largo de este tiempo, son muchos más aquellos que se han volcado en mí ayudándome cada paso que daba. Personas como **Manuel**, la generosidad personificada, **Pablo**, ilusionado continuamente en aprender nuevas cosas, **Fran**, por aconsejar siempre con sabiduría y alegría (y ser la salsa de las celebraciones), **Miguel**, siempre viendo el lado bueno de las cosas, **Isaac**, cada día que pase seguiré lamentando no haber podido ser tu alumno, y a **Luja**, que me brindaste la oportunidad de no solo ser un compañero de asignatura, sino de ser parte de ella, y mostrándome cómo debe ser integrada la enseñanza universitaria. Muchas gracias a todos vosotros por ese granito de arena que habéis aportado (de granito no tiene nada, pero es la expresión). Sed conscientes que sin él, esta montaña caería.

¿Y cómo olvidar a todos aquellos que me han acompañado en el día a día? Es imposible que con todas las experiencias vividas me olvide de agradeceros cada palabra de apoyo, detalle y quebradero de cabeza (que yo os provoqué…) que me habéis brindado. La **Sala de Becarios** no es ese espacio en el que cada uno está con sus cascos escuchando música mientras trabaja pegado a la pantalla del ordenador (que también hay ratos de esos), es un espacio en que todos te ayudan sin importar el cuándo o el porqué. Aquí no importa el mañana, sino que todos podemos hacernos mejores unos a otros. Muchas gracias a todos vosotros

Después de acostumbrarte a estar trabajando con ritmo en la Sala de Becarios, te comes el mundo. Sientes como tu productividad va a mejorar de forma exponencial. Miras el calendario para organizarte las próximas semanas y… adiós ritmo, adiós Sala de Becarios, adiós productividad. Tocan reuniones y evaluaciones del "proyecto de fibro" a punta pala. De primeras, te aseguro que te llevas un mazazo, pero luego se ve con otros ojos. Es en ese momento en el que realmente aprendes de los mejores. En especial, quiero agradecer a los ya seniors del proyecto **Víctor**, **Inma**, **Dani**, **Fernando**, **Alberto** y **Milkana**. Hemos compartido muchas horas de reuniones, viajes, preparación de paquetes de cuestionarios, más viajes, comidas, más viajes, sesiones de evaluaciones (y donde digo sesiones, digo semanas), cursos de formación y también algún que otro viaje. En todos estos momentos, me

habéis enseñado la importancia del trabajo en equipo, habéis sacado tiempo para resolverme esas dudas estadísticas que siempre me surgían, siempre arrimando el hombro para empujar con más fuerza, y sobre todo habéis potenciado cada uno de mis proyectos (las revistas más top estarían orgullosas de teneros en su equipo de revisores). Sois muy grandes, y estoy seguro que con el esfuerzo, dedicación e ilusión que le ponéis a todo, podéis lograr todo aquello que os propongáis.

Imagen 9. Foto para el recuerdo del grueso del equipo de evaluación al inicio del proyecto de fibromialgia.

También es muy importante para mí agradecer a los "nuevos fichajes" del proyecto **Blanca**, **Pedro** e **Inma**. Me gustaría que fuerais conscientes de la importancia que habéis tenido desde que llegasteis al equipo, ya que vuestro trabajo no solo ha servido para darnos la energía de continuar con el proyecto, sino que habéis sido una fuente de la que seguir aprendiendo.

Me siento en la obligación moral de agradecer todos y cada uno de los esfuerzos que han realizado las **Asociaciones de Fibromialgia de Andalucía**. Sin vuestro apoyo y ayuda cada vez que os lo pedíamos, hubiera sido imposible haber llevado a cabo este proyecto. Pero este agradecimiento no queda aquí. Quiero destacar la pasión y gratitud continua que nos habéis mostrado en cada una de nuestras visitas, lo que hacía que cada nuevo viaje fuera ilusionante para poder compartir de nuevo nuestro tiempo con vosotras (y vosotros). Sois el ejemplo de que la investigación no es un proceso amargo y frio, sino dulce y cálido, siendo una experiencia única para cada uno de nosotros.

El equipo PACO ha sido el resultado de varios años de esfuerzos, pero lo más importante es que surge como oportunidad para todos vosotros que os estáis iniciando. Me gustaría dar las gracias a todo el equipo, y en especial a **Emilio** y **Carlos** (ya estáis más que iniciados), que vaya tándem más peligroso. Vosotros no solo sois la base de este equipo, sois su alma. Aún sigo sin comprender cómo no nos hemos cruzado antes en el camino. Siempre estáis ahí cuando se os necesita, siendo inspiradores y salvadores en los momentos claves. Daros muchas gracias por el tiempo y paciencia que me habéis brindado y atender siempre que PACO os lo ha demandado. **Javi**, es increíble la conexión que hemos alcanzado en tan poco tiempo. Siempre escuchando y generando increíbles ideas. Es muy placentero trabajar a tu lado. Esta Tesis ha sido una gran excusa para generar una gran amistad con vosotros. También, personas como **Pepe**, **María Jesús**, **Patri** o **Romina**, habéis llenado de vida este equipo, regalándonos ilusión cada día. Vuestra iniciativa de trabajo e interés por avanzar y aprender es revitalizante.

Imagen 11. Foto de equipo de la primera reunión PACO.

Todo el grupo de personas que componen el equipo PACO no hubiera sido posible reunirlo sin las posibilidades que nos han brindado la **Diputación de Granada**, su área de medio ambiente y todo su equipo. Su interés para integrarnos en su trabajo y colaborar hicieron que cada vez fuéramos más los que nos sumáramos a este proyecto. Y solo maravillas se puede decir de cada uno de los coles,

institutos, profes y alumnos que nos abrieron su aula y se implicaron para que todo saliera viento en popa. Sin todos y cada uno de vosotros no hubiera sido posible; GRACIAS.

I also want to thanks to **Andy** and **Flo**, and the whole Norwich team (**Emma, Rachel, James, Lucy, Caoimbe,…**), which made me feel at home when I visited them. Thank you for share with me your knowledge and your time, and for your patience with my English. You made me a better researcher and a better English speaker (I hope…). It was a really wonderful experience of life. Apart from work, you showed me your culture and daily life. I usually remember the Park Run, our dinner in the Waffle House, your passion with the rugby world cup (in spite of the bad luck for England), the circuit trainings and our coffee/tee stops. I wish to spend some more time there with you. And I also remember my host **Tricia** and the little **Kiel**. Thank you very much for open your house to me, borrow me your bike and for making me feel as other family member. Thanks so much!

Picture 12. Picture of the last lunch of my visit to the Norwich team.

Me acuerdo además de todos mis amigos, que siempre estáis apoyándome y alentando. Para que un entrenamiento sea eficaz, es imprescindible una buena recuperación. Vosotros me habéis dado esa energía extra siempre que lo he necesitado. Y en especial destacar a **Amador**, sin duda alguna el principal culpable de que me encuentre escribiendo estas líneas. Él fue quien sembró la semilla del espíritu investigador en mí cuando tan solo estaba iniciando mis estudios de magisterio, y continuó regándola hasta hoy. Nunca paras de pensar en cómo poder ayudarme y prestándome tu apoyo para lo bueno y lo malo. Muchas gracias **Amador**. ¿Qué decir de ese grupo de deportistas? **Sergio, Ana Belén, María Dolores, Juan, Galiano**,… siempre liados buscando nuevas metas deportivas por cubrir, así como alguna que otra meta festiva. Muchas gracias por vuestros ánimos. A mi equipo de lagartos (**KB Lizards**) y el resto de **Kinboleros**, que tan buenos momentos me hacéis pasar entrenando y compitiendo. Sois ese plus de energía semanal que me permite empezar cada lunes con energías renovadas. Y **Rubén**, a buen entendedor pocas palabras. Da igual la distancia y el tiempo, ya que sabemos que siempre estamos ahí.

No por hablar con vosotros al final, es menos importante. Yo creo que me conocéis bien, y sabéis que siempre el mejor bocado me lo dejo para el final. Quiero agradeceros a todos, **MI FAMILIA**, todo el apoyo diario que me dais. Sois la ilusión para que cada día vaya a trabajar con ganas de superación. No me olvido de ti, **abuelita**, que siempre me preguntabas cómo me iba todo, y aun sin saber bien que es lo que hacía yo por Granada, sé que no parabas de presumir de nieto. Siempre estarás conmigo. También quiero dar las gracias de todo corazón a mis padres **Manolo** y **Trini**, que me habéis apoyado en cada decisión tomada y que me habéis hecho ser la persona que hoy soy. No solo me regalasteis la vida, sino que también me educasteis para disfrutarla, y me inculcasteis una serie valores que nunca encontraré forma de agradecer. Me disteis todo y espero poder encontrar la forma de agradecéroslo. Si de pequeño hubiera podido elegir a mis padres, estoy seguro que os habría elegido a vosotros. Imposible olvidarme de mi hermana **Laura**, que continuamente la tengo a mi lado para darme ese empujoncito cuando lo necesito. Presta a ayudarme en todo lo que puedes, preocupada por cómo voy, arreglándome esas dolencias musculares que aparecen por arte de magia y, especialmente, enseñándome a vivir. Has sido, eres y serás un ejemplo para mí. El trabajo aquí reflejado es todo gracias a vosotros.

Para terminar, ya solo me queda dar las gracias a las dos personas más importantes de mi vida. En primer lugar a ti **Inma**, mi cielo, que nunca has dejado que nada me sobrepase, has aguantado tantas horas, dias, meses y años que le he dedicado a este trabajo, y has comprendido lo que necesitaba en cada momento. Has sido mucho más que un apoyo diario para mí, eres mi compañera de aventuras. Y tuviste el valor de venir conmigo cuando te propuse lo que se avecinaba. Gracias a ti, estos han sido los mejores años de mi vida, y seguro que vendrán mejores porque me has dado el regalo más importante, grande y bonito que nadie podía hacerme. Me trajiste a **Manuel**, que nació junto a esta Tesis, e incluso me echó alguna mano para acabarla. Muchas gracias Manuel por ilusionarme cada día al llegar a casa, y hacerme reír siempre que lo necesitaba. Vosotros dos sois la única causa que me ha hecho seguir hasta el final y que me ilusiona para dar el siguiente paso. Gracias de todo corazón. Os amo.

Imagen 13. Foto de Manuel colaborando activamente en la redacción de la Tesis Doctoral.

¡MUCHAS GRACIAS A TODOS LOS QUE FORMASTEIS PARTE DE ESTA EXPERIENCIA!

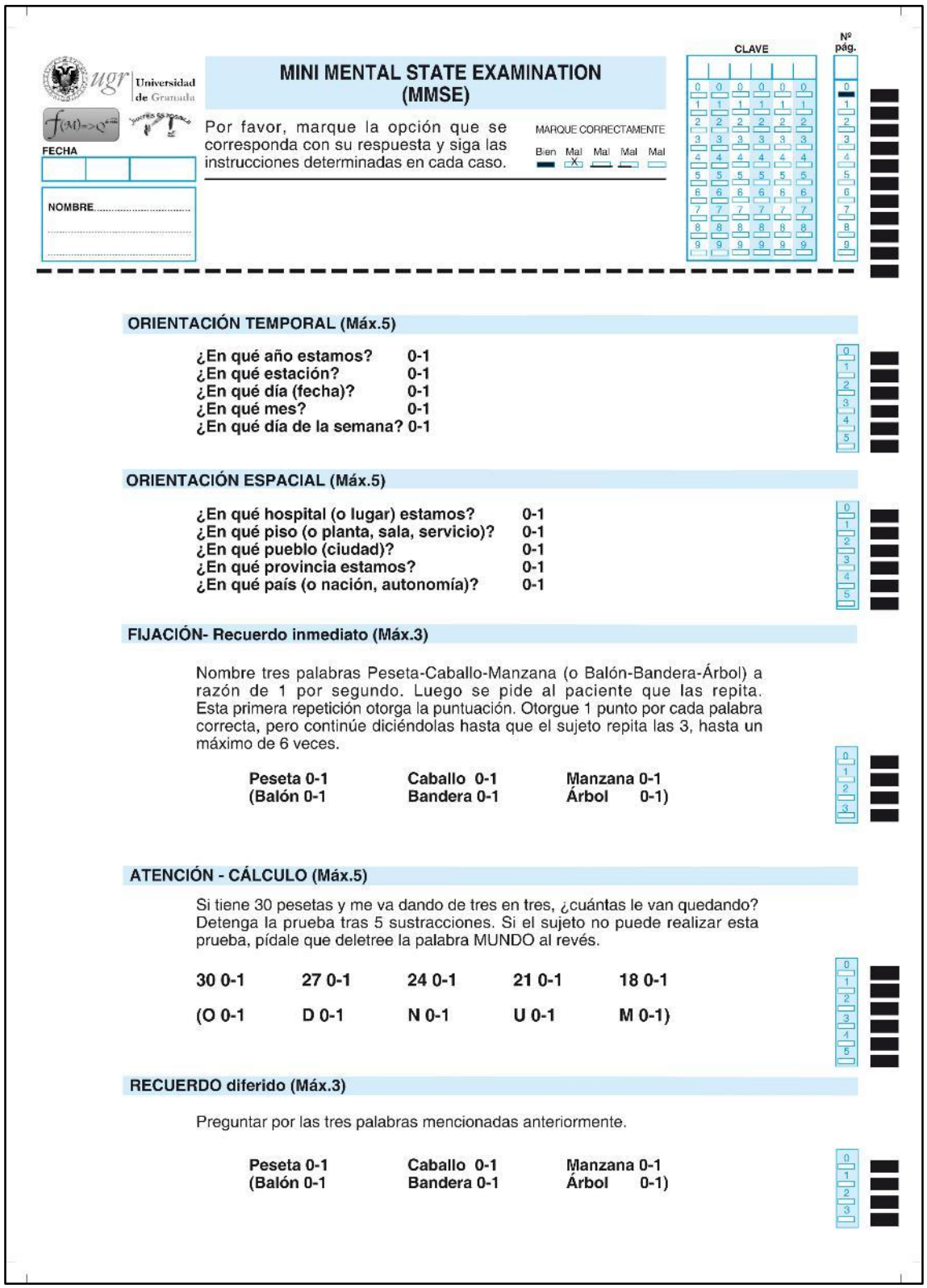
ANNEXES

Queen
The Miracle (1989)
I want it all

ANNEXES

1. Mini-Mental State Examination (Studies I to IV).
2. International Physical Activity Questionnaire (Study I).
3. Beck Depression Inventory (Study IV).
4. Assessing Levels of Physical Activity and fitness Questionnaire and mode of commuting questionnaire (Studies I to IV).
5. Revised Fibromyalgia Impact Questionnaire (Study IV).
6. 36-items Short Form healthy survey (Study IV).
7. Pittsburgh Sleep Quality Index (Study IV).
8. Pain Catastrophizing Scale (Study IV).
9. Chronic Pain Self-efficacy Scale (Study IV).
10. Multidimensional Fatigue Inventory (Study IV).
11. Electronic search for the studies including: database, number of references found and terms included (Study V).
12. Mode and Frequency of Commuting to and from School Questionnaire (Studies VI to VIII).
13. Commuting to school questionnaire (Study IX).

Annexe 1. Mini-Mental State Examination (Studies I to IV).



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MINI MENTAL STATE EXAMINATION (MMSE)

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág.

FECHA

NOMBRE.....

ORIENTACIÓN TEMPORAL (Máx.5)

¿En qué año estamos? 0-1
¿En qué estación? 0-1
¿En qué día (fecha)? 0-1
¿En qué mes? 0-1
¿En qué día de la semana? 0-1

ORIENTACIÓN ESPACIAL (Máx.5)

¿En qué hospital (o lugar) estamos? 0-1
¿En qué piso (o planta, sala, servicio)? 0-1
¿En qué pueblo (ciudad)? 0-1
¿En qué provincia estamos? 0-1
¿En qué país (o nación, autonomía)? 0-1

FIJACIÓN- Recuerdo inmediato (Máx.3)

Nombre tres palabras Peseta-Caballo-Manzana (o Balón-Bandera-Árbol) a razón de 1 por segundo. Luego se pide al paciente que las repita. Esta primera repetición otorga la puntuación. Otorgue 1 punto por cada palabra correcta, pero continúe diciéndolas hasta que el sujeto repita las 3, hasta un máximo de 6 veces.

Peseta 0-1 Caballo 0-1 Manzana 0-1
(Balón 0-1 Bandera 0-1 Árbol 0-1)

ATENCIÓN - CÁLCULO (Máx.5)

Si tiene 30 pesetas y me va dando de tres en tres, ¿cuántas le van quedando? Detenga la prueba tras 5 sustracciones. Si el sujeto no puede realizar esta prueba, pídale que deletree la palabra MUNDO al revés.

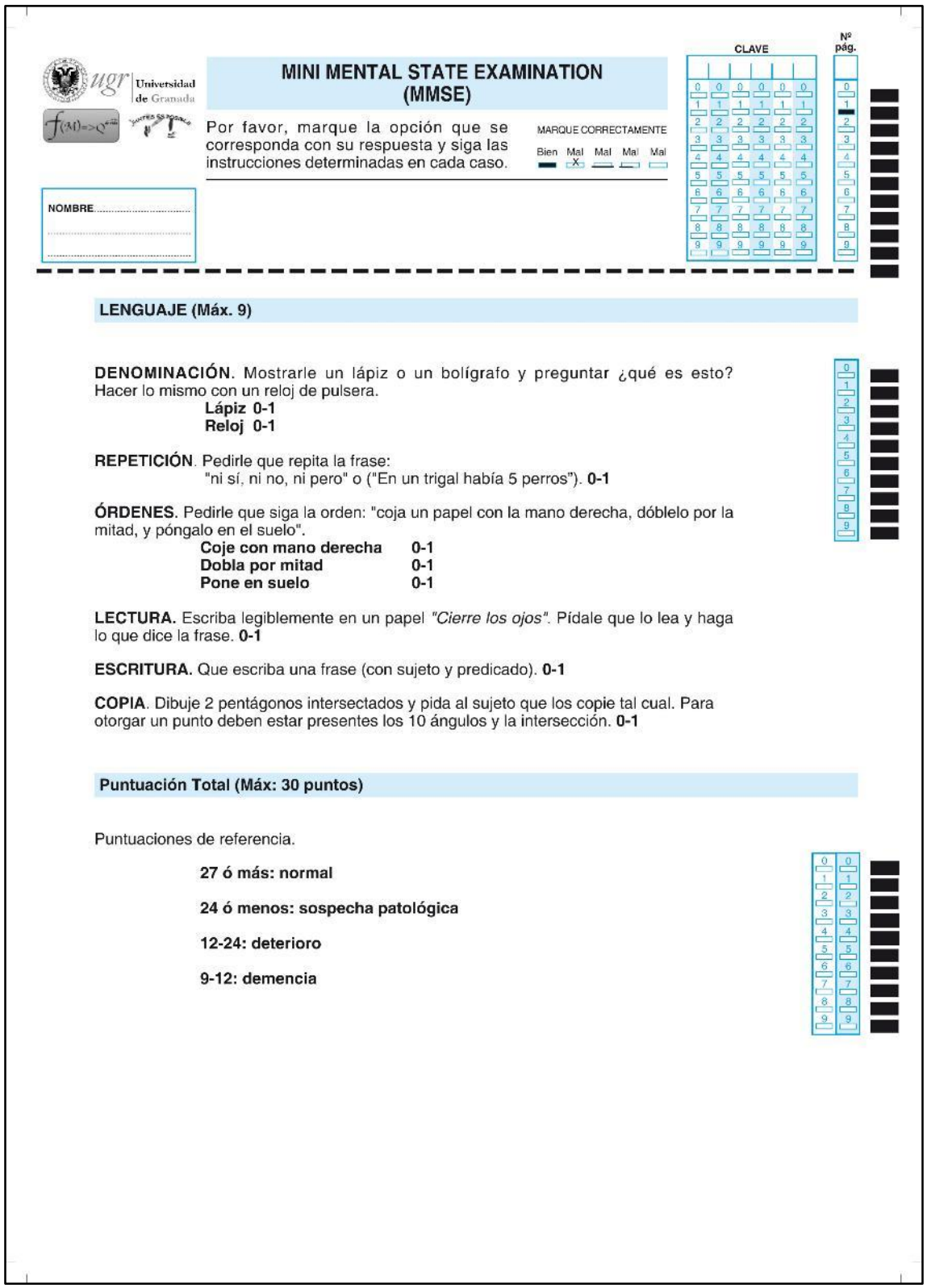
30 0-1 27 0-1 24 0-1 21 0-1 18 0-1

(O 0-1 D 0-1 N 0-1 U 0-1 M 0-1)

RECUERDO diferido (Máx.3)

Preguntar por las tres palabras mencionadas anteriormente.

Peseta 0-1 Caballo 0-1 Manzana 0-1
(Balón 0-1 Bandera 0-1 Árbol 0-1)



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MINI MENTAL STATE EXAMINATION (MMSE)

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien | Mal (X) | Mal | Mal | Mal

CLAVE

Nº pág.

NOMBRE.....

.....

.....

LENGUAJE (Máx. 9)

DENOMINACIÓN. Mostrarle un lápiz o un bolígrafo y preguntar ¿qué es esto? Hacer lo mismo con un reloj de pulsera.

Lápiz 0-1
Reloj 0-1

REPETICIÓN. Pedirle que repita la frase:
"ni sí, ni no, ni pero" o ("En un trigal había 5 perros"). **0-1**

ÓRDENES. Pedirle que siga la orden: "coja un papel con la mano derecha, dóblelo por la mitad, y póngalo en el suelo".

Coje con mano derecha 0-1
Dobla por mitad 0-1
Pone en suelo 0-1

LECTURA. Escriba legiblemente en un papel *"Cierre los ojos"*. Pídale que lo lea y haga lo que dice la frase. **0-1**

ESCRITURA. Que escriba una frase (con sujeto y predicado). **0-1**

COPIA. Dibuje 2 pentágonos intersectados y pida al sujeto que los copie tal cual. Para otorgar un punto deben estar presentes los 10 ángulos y la intersección. **0-1**

Puntuación Total (Máx: 30 puntos)

Puntuaciones de referencia.

27 ó más: normal

24 ó menos: sospecha patológica

12-24: deterioro

9-12: demencia

Annexe 2. International Physical Activity Questionnaire (Study I).

Apellidos y Nombre _____ Cod. _____

Hora INICIO: _____ Fecha _____

Cuestionario Internacional de Actividad Física IPAQ

El cuestionario ha sido preparado para la obtención de datos sobre actividad física relacionada con la salud de sujetos jóvenes y adultos de mediana edad (15-69 años)

Las preguntas irán referidas a la actividad realizada por usted en los últimos 7 días. Cuando se le pregunte por cuantos días o cuanto tiempo piense usted en actividades que realiza

Debe marcar una sola respuesta. Para marcarla haga una cruz en el lugar correspondiente, o contestar numéricamente en el caso de que se le pida.

Parte 1: Actividad física relacionada con el trabajo

1. ¿Tiene actualmente un trabajo o hace algún trabajo, remunerado o no, fuera de casa?
   - ○ (1)SI
   - ○ (0)NO ---->Pase a la parte 2 Transporte, pregunta nº 8
2. ¿Cuántos días realizó usted actividades físicas **vigorosas*** como levantar objetos pesados, excavar, construcción pesada, o subir escaleras **como parte de su trabajo**?
   - ☐ (0)No Actividad Física Vigorosa ----->
   - ☐ días a la semana
   - ☐ (8)No sabe/No está seguro
3. ¿Cuánto tiempo en total usualmente le ocupa realizar actividades físicas **vigorosas** en uno de esos días **como parte de su trabajo**?
   - Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro
4. ¿Cuántos días hizo usted actividades físicas **moderadas**** como cargar con cosas ligeras **como parte de su trabajo**?
   - ☐ (0)No Actividad Física Moderada ------>
   - ☐ días a la semana
5. ¿Cuánto tiempo en total usualmente le ocupa realizar actividades físicas **moderadas** en uno de esos días **como parte de su trabajo**?
   - Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

*Actividad Física Vigorosa: Actividad Física equivalente de forma aproximada a correr de manera contínua
**Actividad Física Moderada: Actividad Física equivalente de forma aproximada a caminar a paso ligero

Página 1 de 4

6. ¿Cuántos días **caminó** usted al menos 10 minutos continuos **como parte de su trabajo**?

☐ (0)Ninguna caminata relacionada con el trabajo --->

☐ días a la semana

7. ¿Cuánto tiempo en total paso generalmente caminando en uno de esos días como parte de su trabajo?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Parte 2: Actividad física relacionada con transporte

8. ¿Cuántos días **viajó usted en un vehículo de motor** como un tren, bus, automóvil, o tranvía?

☐ (0)No viajó en vehículo de motor ------>

☐ días a la semana

9. ¿Cuánto tiempo gasto usted en uno de esos días **viajando** en un tren, bus, automóvil, tranvía u otra clase de vehículo a motor?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

10. ¿Cuántos días **montó usted en bicicleta** para **ir de un lugar a otro**?

☐ (0)No montó en bicicleta de un sitio a otro ------>

☐ días a la semana

11. ¿Cuánto tiempo pasó usted en uno de esos días **montando en bicicleta** de un lugar a otro?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

12. ¿Cuántos días camino usted al menos 10 minutos continuos para ir **de un sitio a otro**?

☐ (0)Ninguna caminata de un sitio a otro ------>

☐ días a la semana

13. ¿Cuánto tiempo pasó usted en uno de esos días **caminando** de un sitio a otro?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Página 2 de 4

Parte 3: Trabajo de la casa, mantenimiento de la casa, y cuidado de la familia

¿Tiene usted en casa jardín o patio? En caso negativo pasar a la pregunta 18

14. ¿Cuántos días hizo usted actividades **vigorosas** tal como levantar objetos pesados, cortar madera, excavar el **jardín o patio**?

☐ (0)Ninguna Actividad Física Vigorosa ------>

☐ días a la semana

15. ¿Cuánto tiempo dedica usted en uno de esos días a hacer actividades físicas **vigorosas** en el **jardín o patio**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

16. ¿Cuántos días hizo usted actividades **moderadas** tal como cargar objetos livianos, barrer, lavar ventanas, y trabajar en el **jardín o patio**?

☐ (0)Ninguna Actividad Física Moderada ------>

☐ días a la semana

17. ¿Cuánto tiempo dedica usted en uno de esos días a hacer actividades físicas **moderadas** en el **jardín o patio**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

18. ¿Cuántos días hizo usted actividades **moderadas** tal como cargar objetos livianos, barrer, lavar ventanas, y fregar el suelo y **barrer dentro de su casa**?

☐ (0)Ninguna Actividad Física Moderada ------>

☐ días a la semana

19. ¿Cuánto tiempo dedica usted en uno de esos días a hacer actividades físicas **moderadas dentro de su casa**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Parte 4: Actividades Físicas de recreación, deporte y tiempo libre

20. ¿Cuántos días **caminó** usted por lo menos 10 minutos continuos **en su tiempo libre**?

☐ (0)Ninguna caminata en el tiempo libre ------>

☐ días a la semana

21. ¿Cuánto tiempo gastó usted en uno de esos días **caminando en su tiempo libre**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Página 3 de 4

22. ¿Cuántos días hizo usted actividades físicas **vigorosas** tal y como aeróbicos, correr, pedalear rápido en bicicleta, o nadar rápido **en su tiempo libre**?

☐ (0)Ninguna Actividad Física Vigorosa ------>

☐ días a la semana

23. ¿Cuánto tiempo dedica usted en uno de estos días a hacer actividades físicas **vigorosas en su tiempo libre**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

24. ¿Cuántos días hizo usted actividades físicas **moderadas** tal y como pedalear en bicicleta a paso regular, nadar a paso regular jugar a dobles de tenis, **en su tiempo libre**?

☐ (0)Ninguna Actividad Física Moderada ------>

☐ días a la semana

25. ¿Cuánto tiempo dedica usted en uno de estos días a hacer actividades físicas **moderadas en su tiempo libre**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Parte 5: Tiempo dedicado a estar sentado(a)

26. ¿Cuánto tiempo permaneció **sentado(a)** en **un día de la semana**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

27. ¿Cuánto tiempo permaneció **sentado(a)** en un día **del fin de semana**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

28. ¿Cuánto tiempo permaneció **tumbado(a)** en **un dia de la semana**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

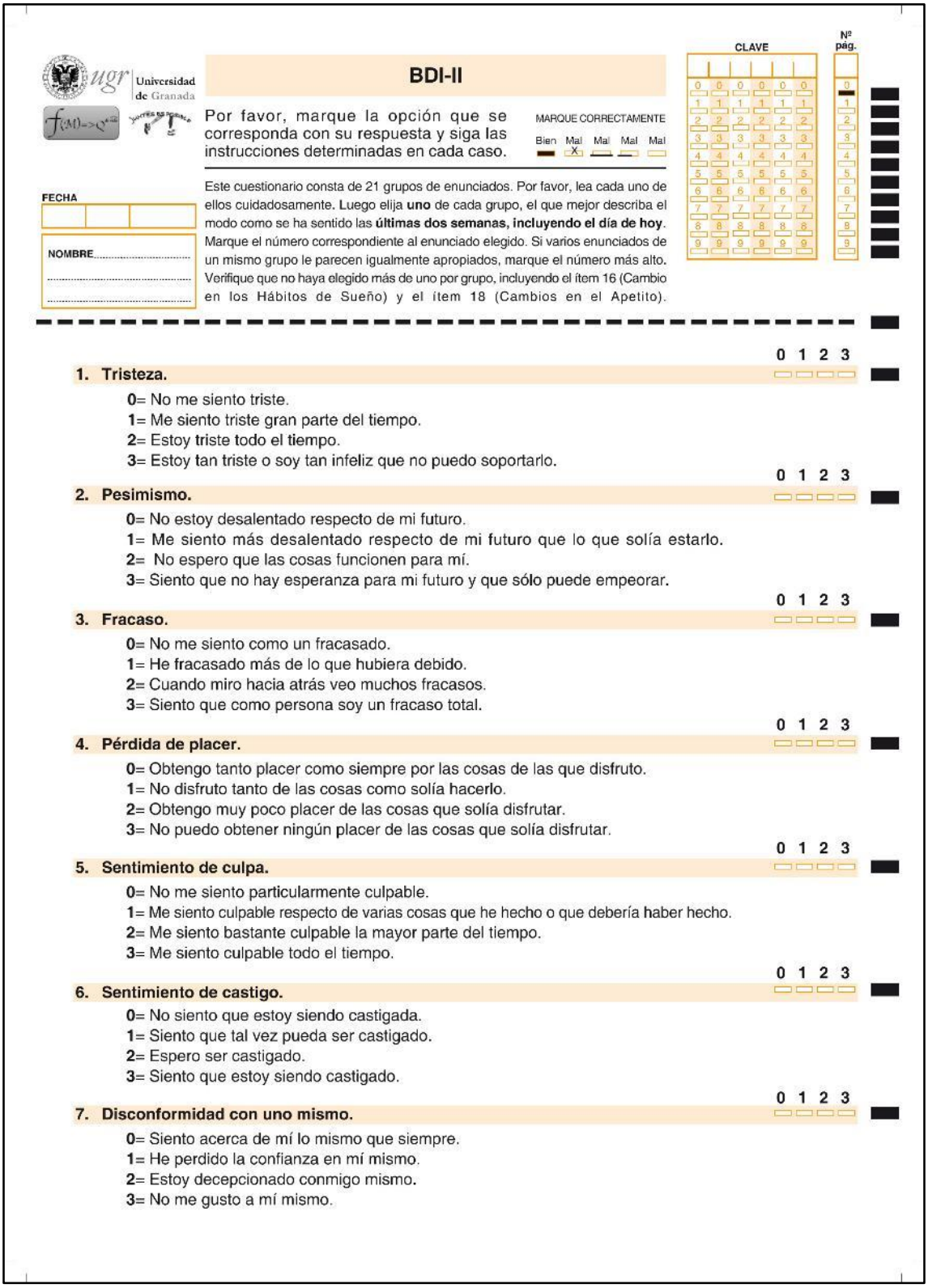
29. ¿Cuánto tiempo permaneció **tumbado (a)** en **un dia del fin de semana**?

Horas ☐ Minutos ☐ ☐ (0)No sabe/No está seguro

Página 4 de 4

Hora FIN: _____

Annexe 3. Beck Depression Inventory (Study IV).



Universidad de Granada

BDI-II

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág.

FECHA

NOMBRE.....

Este cuestionario consta de 21 grupos de enunciados. Por favor, lea cada uno de ellos cuidadosamente. Luego elija **uno** de cada grupo, el que mejor describa el modo como se ha sentido las **últimas dos semanas, incluyendo el día de hoy**. Marque el número correspondiente al enunciado elegido. Si varios enunciados de un mismo grupo le parecen igualmente apropiados, marque el número más alto. Verifique que no haya elegido más de uno por grupo, incluyendo el ítem 16 (Cambio en los Hábitos de Sueño) y el ítem 18 (Cambios en el Apetito).

0 1 2 3

1. Tristeza.

0= No me siento triste.
1= Me siento triste gran parte del tiempo.
2= Estoy triste todo el tiempo.
3= Estoy tan triste o soy tan infeliz que no puedo soportarlo.

0 1 2 3

2. Pesimismo.

0= No estoy desalentado respecto de mi futuro.
1= Me siento más desalentado respecto de mi futuro que lo que solía estarlo.
2= No espero que las cosas funcionen para mí.
3= Siento que no hay esperanza para mi futuro y que sólo puede empeorar.

0 1 2 3

3. Fracaso.

0= No me siento como un fracasado.
1= He fracasado más de lo que hubiera debido.
2= Cuando miro hacia atrás veo muchos fracasos.
3= Siento que como persona soy un fracaso total.

0 1 2 3

4. Pérdida de placer.

0= Obtengo tanto placer como siempre por las cosas de las que disfruto.
1= No disfruto tanto de las cosas como solía hacerlo.
2= Obtengo muy poco placer de las cosas que solía disfrutar.
3= No puedo obtener ningún placer de las cosas que solía disfrutar.

0 1 2 3

5. Sentimiento de culpa.

0= No me siento particularmente culpable.
1= Me siento culpable respecto de varias cosas que he hecho o que debería haber hecho.
2= Me siento bastante culpable la mayor parte del tiempo.
3= Me siento culpable todo el tiempo.

0 1 2 3

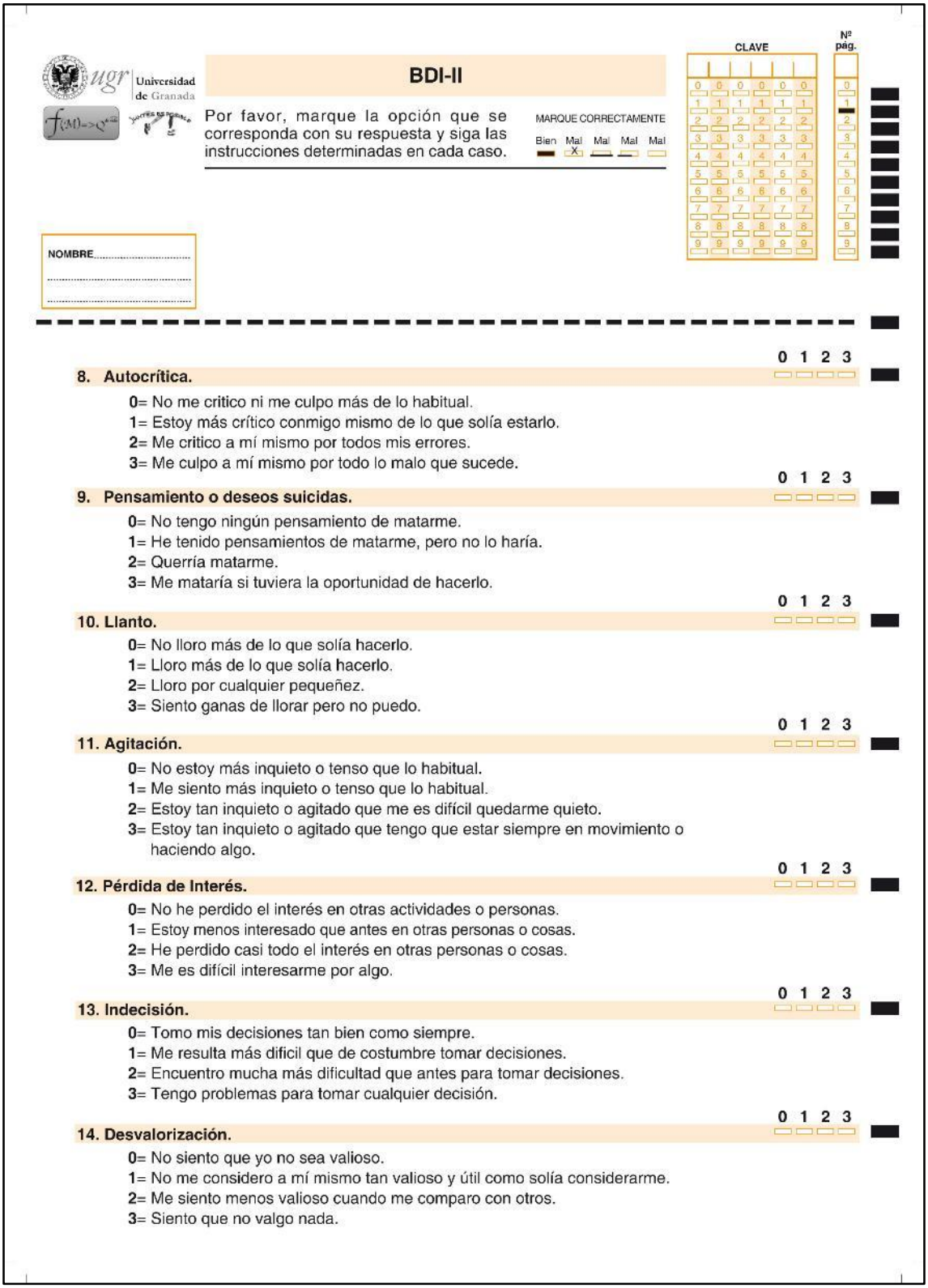
6. Sentimiento de castigo.

0= No siento que estoy siendo castigada.
1= Siento que tal vez pueda ser castigado.
2= Espero ser castigado.
3= Siento que estoy siendo castigado.

0 1 2 3

7. Disconformidad con uno mismo.

0= Siento acerca de mí lo mismo que siempre.
1= He perdido la confianza en mí mismo.
2= Estoy decepcionado conmigo mismo.
3= No me gusto a mí mismo.



Universidad de Granada

BDI-II

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien | Mal (X) | Mal | Mal | Mal

CLAVE

Nº pág.

NOMBRE.....

8. Autocrítica. 0 1 2 3

0= No me critico ni me culpo más de lo habitual.
1= Estoy más crítico conmigo mismo de lo que solía estarlo.
2= Me critico a mí mismo por todos mis errores.
3= Me culpo a mí mismo por todo lo malo que sucede.

9. Pensamiento o deseos suicidas. 0 1 2 3

0= No tengo ningún pensamiento de matarme.
1= He tenido pensamientos de matarme, pero no lo haría.
2= Querría matarme.
3= Me mataría si tuviera la oportunidad de hacerlo.

10. Llanto. 0 1 2 3

0= No lloro más de lo que solía hacerlo.
1= Lloro más de lo que solía hacerlo.
2= Lloro por cualquier pequeñez.
3= Siento ganas de llorar pero no puedo.

11. Agitación. 0 1 2 3

0= No estoy más inquieto o tenso que lo habitual.
1= Me siento más inquieto o tenso que lo habitual.
2= Estoy tan inquieto o agitado que me es difícil quedarme quieto.
3= Estoy tan inquieto o agitado que tengo que estar siempre en movimiento o haciendo algo.

12. Pérdida de Interés. 0 1 2 3

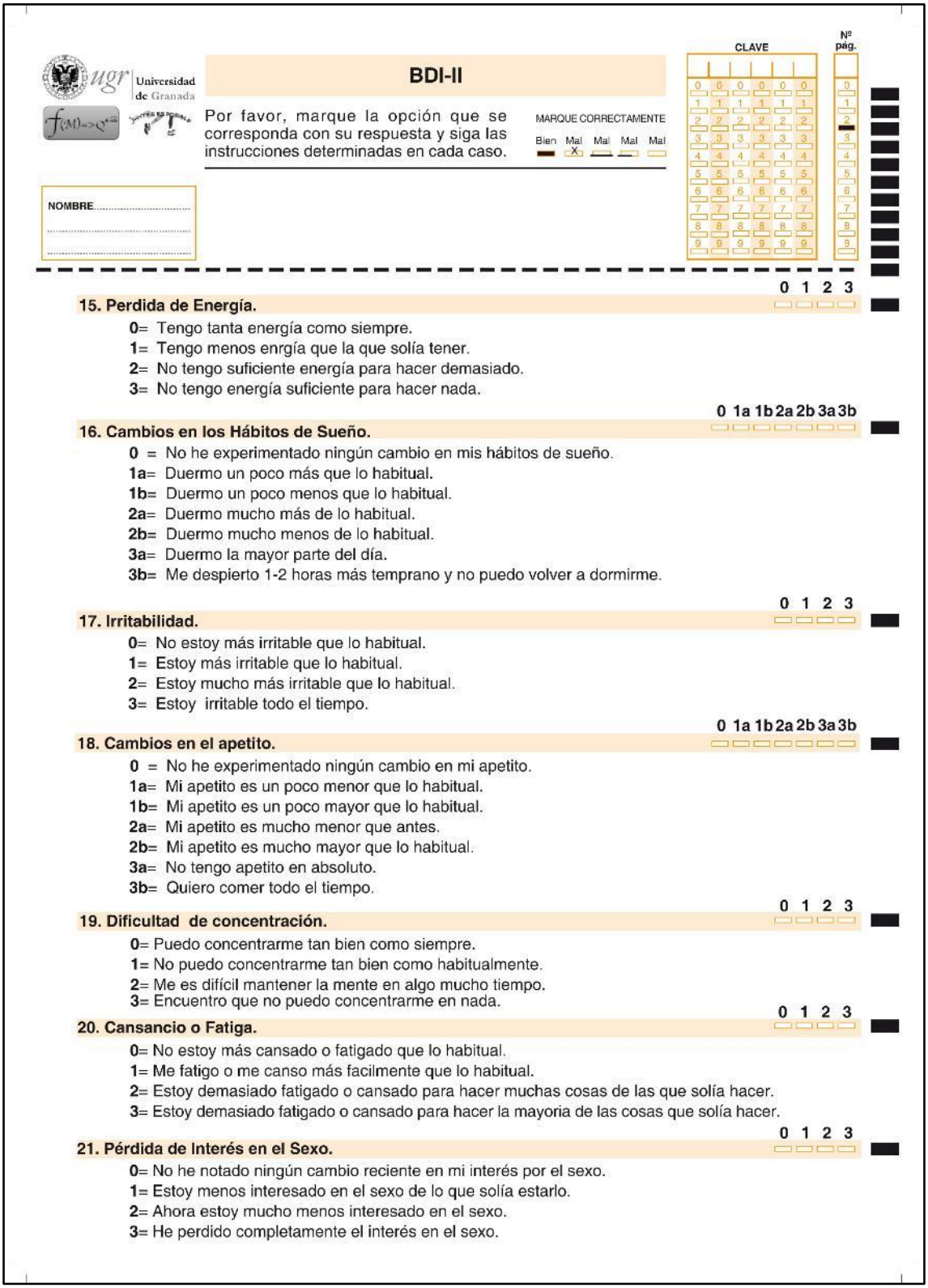
0= No he perdido el interés en otras actividades o personas.
1= Estoy menos interesado que antes en otras personas o cosas.
2= He perdido casi todo el interés en otras personas o cosas.
3= Me es difícil interesarme por algo.

13. Indecisión. 0 1 2 3

0= Tomo mis decisiones tan bien como siempre.
1= Me resulta más difícil que de costumbre tomar decisiones.
2= Encuentro mucha más dificultad que antes para tomar decisiones.
3= Tengo problemas para tomar cualquier decisión.

14. Desvalorización. 0 1 2 3

0= No siento que yo no sea valioso.
1= No me considero a mí mismo tan valioso y útil como solía considerarme.
2= Me siento menos valioso cuando me comparo con otros.
3= Siento que no valgo nada.



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BDI-II

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien | Mal (X) | Mal | Mal | Mal

CLAVE

Nº pág.

NOMBRE.....

15. Perdida de Energía. 0 1 2 3

0= Tengo tanta energía como siempre.
1= Tengo menos enrgía que la que solía tener.
2= No tengo suficiente energía para hacer demasiado.
3= No tengo energía suficiente para hacer nada.

16. Cambios en los Hábitos de Sueño. 0 1a 1b 2a 2b 3a 3b

0 = No he experimentado ningún cambio en mis hábitos de sueño.
1a= Duermo un poco más que lo habitual.
1b= Duermo un poco menos que lo habitual.
2a= Duermo mucho más de lo habitual.
2b= Duermo mucho menos de lo habitual.
3a= Duermo la mayor parte del día.
3b= Me despierto 1-2 horas más temprano y no puedo volver a dormirme.

17. Irritabilidad. 0 1 2 3

0= No estoy más irritable que lo habitual.
1= Estoy más irritable que lo habitual.
2= Estoy mucho más irritable que lo habitual.
3= Estoy irritable todo el tiempo.

18. Cambios en el apetito. 0 1a 1b 2a 2b 3a 3b

0 = No he experimentado ningún cambio en mi apetito.
1a= Mi apetito es un poco menor que lo habitual.
1b= Mi apetito es un poco mayor que lo habitual.
2a= Mi apetito es mucho menor que antes.
2b= Mi apetito es mucho mayor que lo habitual.
3a= No tengo apetito en absoluto.
3b= Quiero comer todo el tiempo.

19. Dificultad de concentración. 0 1 2 3

0= Puedo concentrarme tan bien como siempre.
1= No puedo concentrarme tan bien como habitualmente.
2= Me es difícil mantener la mente en algo mucho tiempo.
3= Encuentro que no puedo concentrarme en nada.

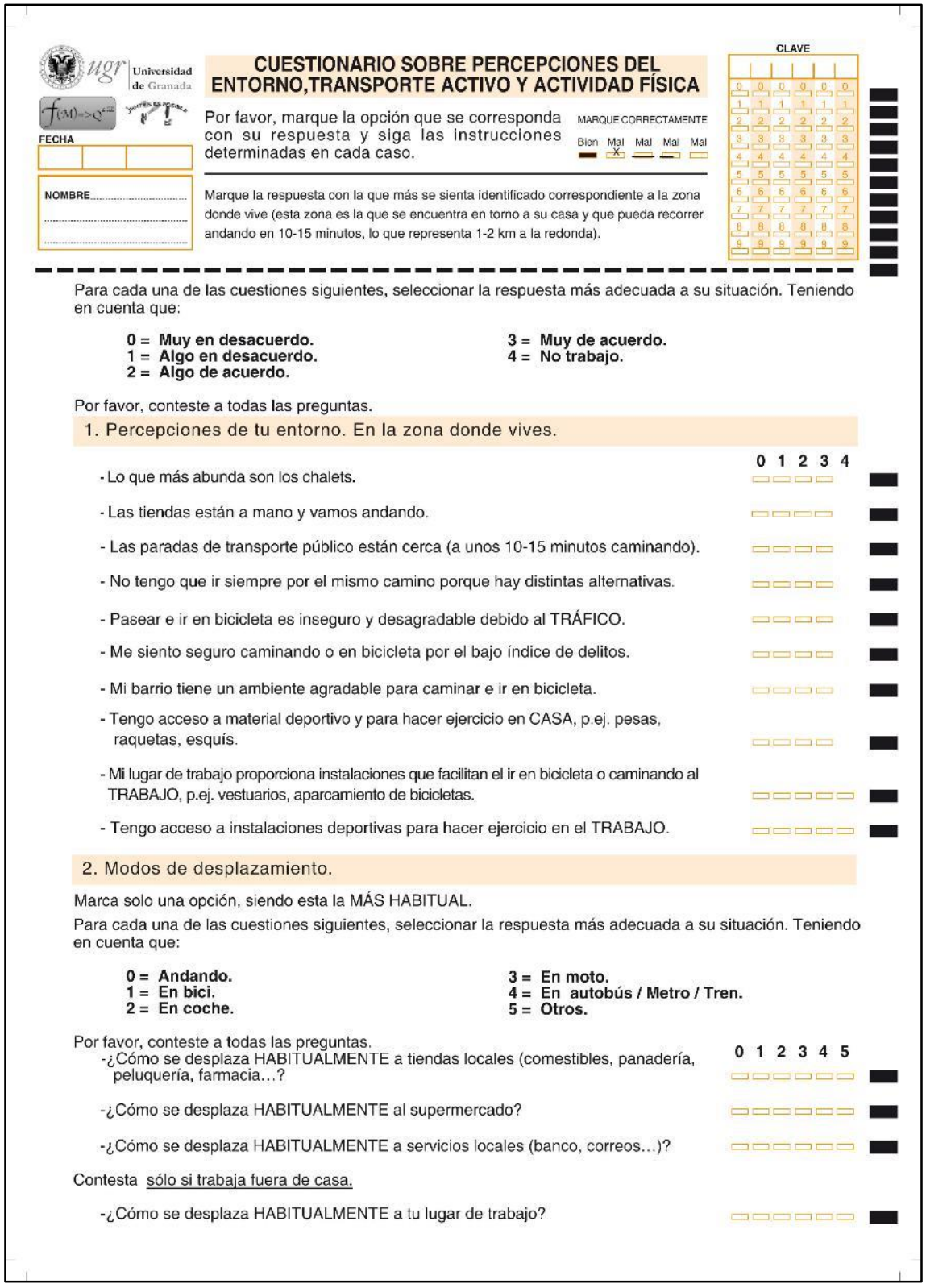
20. Cansancio o Fatiga. 0 1 2 3

0= No estoy más cansado o fatigado que lo habitual.
1= Me fatigo o me canso más facilmente que lo habitual.
2= Estoy demasiado fatigado o cansado para hacer muchas cosas de las que solía hacer.
3= Estoy demasiado fatigado o cansado para hacer la mayoria de las cosas que solía hacer.

21. Pérdida de Interés en el Sexo. 0 1 2 3

0= No he notado ningún cambio reciente en mi interés por el sexo.
1= Estoy menos interesado en el sexo de lo que solía estarlo.
2= Ahora estoy mucho menos interesado en el sexo.
3= He perdido completamente el interés en el sexo.

Annexe 4. Assessing Levels of Physical Activity and fitness Questionnaire and mode of commuting questionnaire (Studies I to IV).



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CUESTIONARIO SOBRE PERCEPCIONES DEL ENTORNO,TRANSPORTE ACTIVO Y ACTIVIDAD FÍSICA

CLAVE

FECHA

NOMBRE.....

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien Mal Mal Mal Mal

Marque la respuesta con la que más se sienta identificado correspondiente a la zona donde vive (esta zona es la que se encuentra en torno a su casa y que pueda recorrer andando en 10-15 minutos, lo que representa 1-2 km a la redonda).

Para cada una de las cuestiones siguientes, seleccionar la respuesta más adecuada a su situación. Teniendo en cuenta que:

0 = Muy en desacuerdo.
1 = Algo en desacuerdo.
2 = Algo de acuerdo.
3 = Muy de acuerdo.
4 = No trabajo.

Por favor, conteste a todas las preguntas.

1. Percepciones de tu entorno. En la zona donde vives.

	0	1	2	3	4
- Lo que más abunda son los chalets.					
- Las tiendas están a mano y vamos andando.					
- Las paradas de transporte público están cerca (a unos 10-15 minutos caminando).					
- No tengo que ir siempre por el mismo camino porque hay distintas alternativas.					
- Pasear e ir en bicicleta es inseguro y desagradable debido al TRÁFICO.					
- Me siento seguro caminando o en bicicleta por el bajo índice de delitos.					
- Mi barrio tiene un ambiente agradable para caminar e ir en bicicleta.					
- Tengo acceso a material deportivo y para hacer ejercicio en CASA, p.ej. pesas, raquetas, esquís.					
- Mi lugar de trabajo proporciona instalaciones que facilitan el ir en bicicleta o caminando al TRABAJO, p.ej. vestuarios, aparcamiento de bicicletas.					
- Tengo acceso a instalaciones deportivas para hacer ejercicio en el TRABAJO.					

2. Modos de desplazamiento.

Marca solo una opción, siendo esta la MÁS HABITUAL.

Para cada una de las cuestiones siguientes, seleccionar la respuesta más adecuada a su situación. Teniendo en cuenta que:

0 = Andando.
1 = En bici.
2 = En coche.
3 = En moto.
4 = En autobús / Metro / Tren.
5 = Otros.

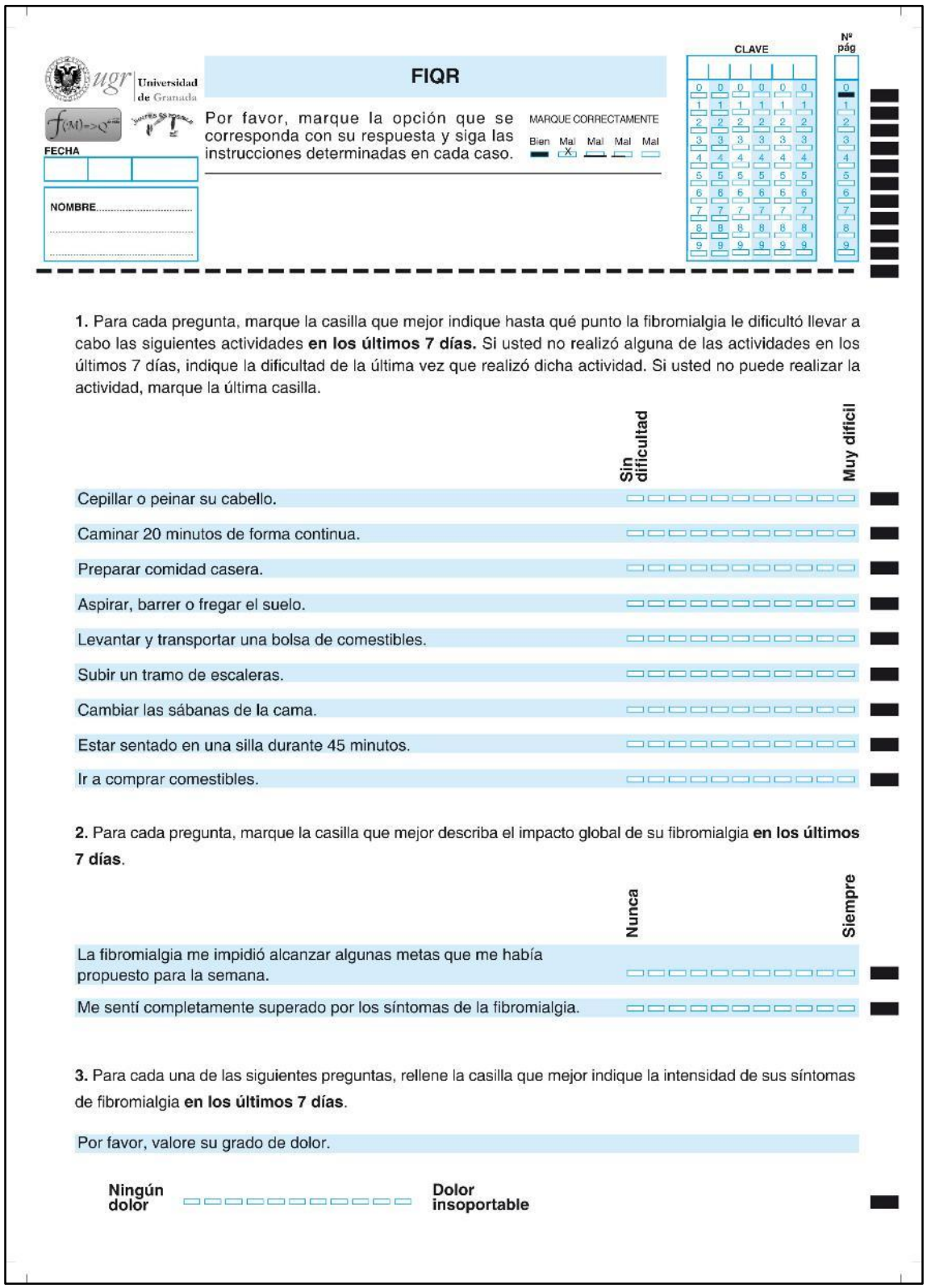
Por favor, conteste a todas las preguntas.

	0	1	2	3	4	5
-¿Cómo se desplaza HABITUALMENTE a tiendas locales (comestibles, panadería, peluquería, farmacia…?						
-¿Cómo se desplaza HABITUALMENTE al supermercado?						
-¿Cómo se desplaza HABITUALMENTE a servicios locales (banco, correos…)?						

Contesta sólo si trabaja fuera de casa.

-¿Cómo se desplaza HABITUALMENTE a tu lugar de trabajo?						

Annexe 5. Revised Fibromyalgia Impact Questionnaire (Study IV).



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FIQR

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

FECHA

NOMBRE.....

CLAVE

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1. Para cada pregunta, marque la casilla que mejor indique hasta qué punto la fibromialgia le dificultó llevar a cabo las siguientes actividades **en los últimos 7 días.** Si usted no realizó alguna de las actividades en los últimos 7 días, indique la dificultad de la última vez que realizó dicha actividad. Si usted no puede realizar la actividad, marque la última casilla.

	Sin dificultad	Muy difícil
Cepillar o peinar su cabello.		
Caminar 20 minutos de forma continua.		
Preparar comidad casera.		
Aspirar, barrer o fregar el suelo.		
Levantar y transportar una bolsa de comestibles.		
Subir un tramo de escaleras.		
Cambiar las sábanas de la cama.		
Estar sentado en una silla durante 45 minutos.		
Ir a comprar comestibles.		

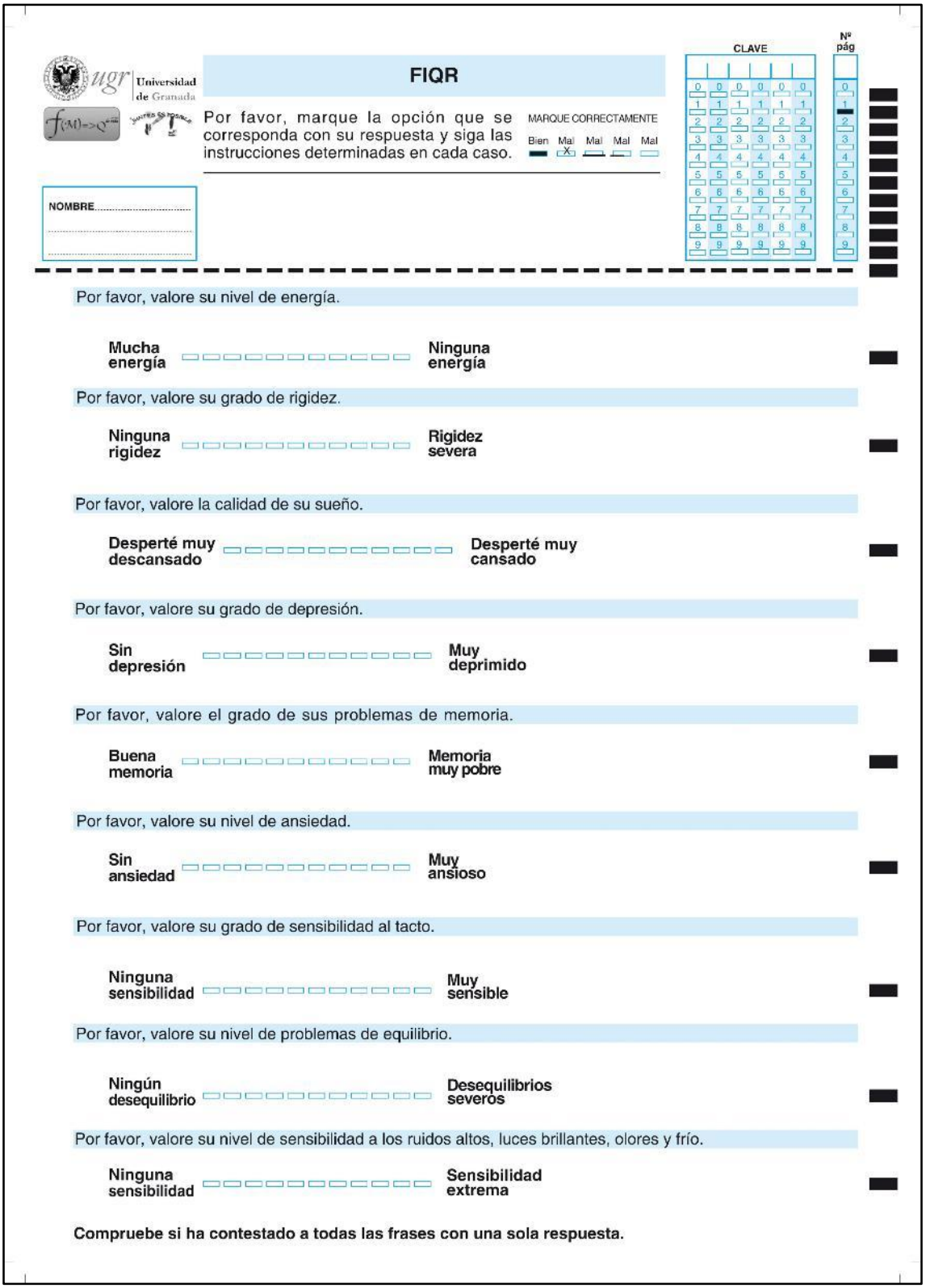
2. Para cada pregunta, marque la casilla que mejor describa el impacto global de su fibromialgia **en los últimos 7 días**.

	Nunca	Siempre
La fibromialgia me impidió alcanzar algunas metas que me había propuesto para la semana.		
Me sentí completamente superado por los síntomas de la fibromialgia.		

3. Para cada una de las siguientes preguntas, rellene la casilla que mejor indique la intensidad de sus síntomas de fibromialgia **en los últimos 7 días**.

Por favor, valore su grado de dolor.

Ningún dolor — **Dolor insoportable**



Universidad de Granada

FIQR

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág

NOMBRE.....

Por favor, valore su nivel de energía.

Mucha energía ▭▭▭▭▭▭▭▭▭▭ **Ninguna energía**

Por favor, valore su grado de rigidez.

Ninguna rigidez ▭▭▭▭▭▭▭▭▭▭ **Rigidez severa**

Por favor, valore la calidad de su sueño.

Desperté muy descansado ▭▭▭▭▭▭▭▭▭▭ **Desperté muy cansado**

Por favor, valore su grado de depresión.

Sin depresión ▭▭▭▭▭▭▭▭▭▭ **Muy deprimido**

Por favor, valore el grado de sus problemas de memoria.

Buena memoria ▭▭▭▭▭▭▭▭▭▭ **Memoria muy pobre**

Por favor, valore su nivel de ansiedad.

Sin ansiedad ▭▭▭▭▭▭▭▭▭▭ **Muy ansioso**

Por favor, valore su grado de sensibilidad al tacto.

Ninguna sensibilidad ▭▭▭▭▭▭▭▭▭▭ **Muy sensible**

Por favor, valore su nivel de problemas de equilibrio.

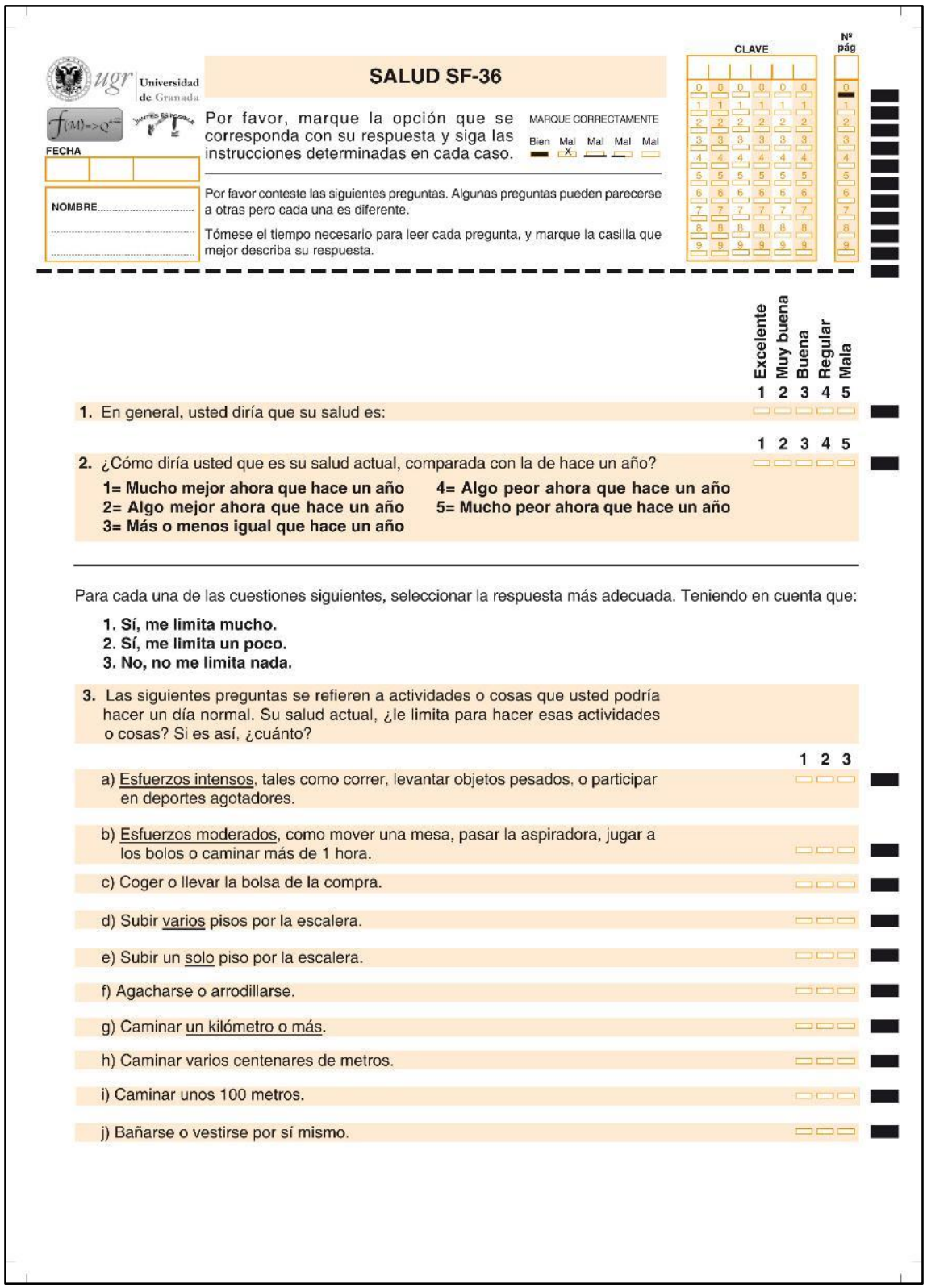
Ningún desequilibrio ▭▭▭▭▭▭▭▭▭▭ **Desequilibrios severos**

Por favor, valore su nivel de sensibilidad a los ruidos altos, luces brillantes, olores y frío.

Ninguna sensibilidad ▭▭▭▭▭▭▭▭▭▭ **Sensibilidad extrema**

Compruebe si ha contestado a todas las frases con una sola respuesta.

Annexe 6. 36-items Short Form healthy survey (Study IV).



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FECHA

NOMBRE.....

SALUD SF-36

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE
Bien Mal Mal Mal Mal

Por favor conteste las siguientes preguntas. Algunas preguntas pueden parecerse a otras pero cada una es diferente.

Tómese el tiempo necesario para leer cada pregunta, y marque la casilla que mejor describa su respuesta.

CLAVE

Nº pág

	Excelente	Muy buena	Buena	Regular	Mala
	1	2	3	4	5

1. En general, usted diría que su salud es:

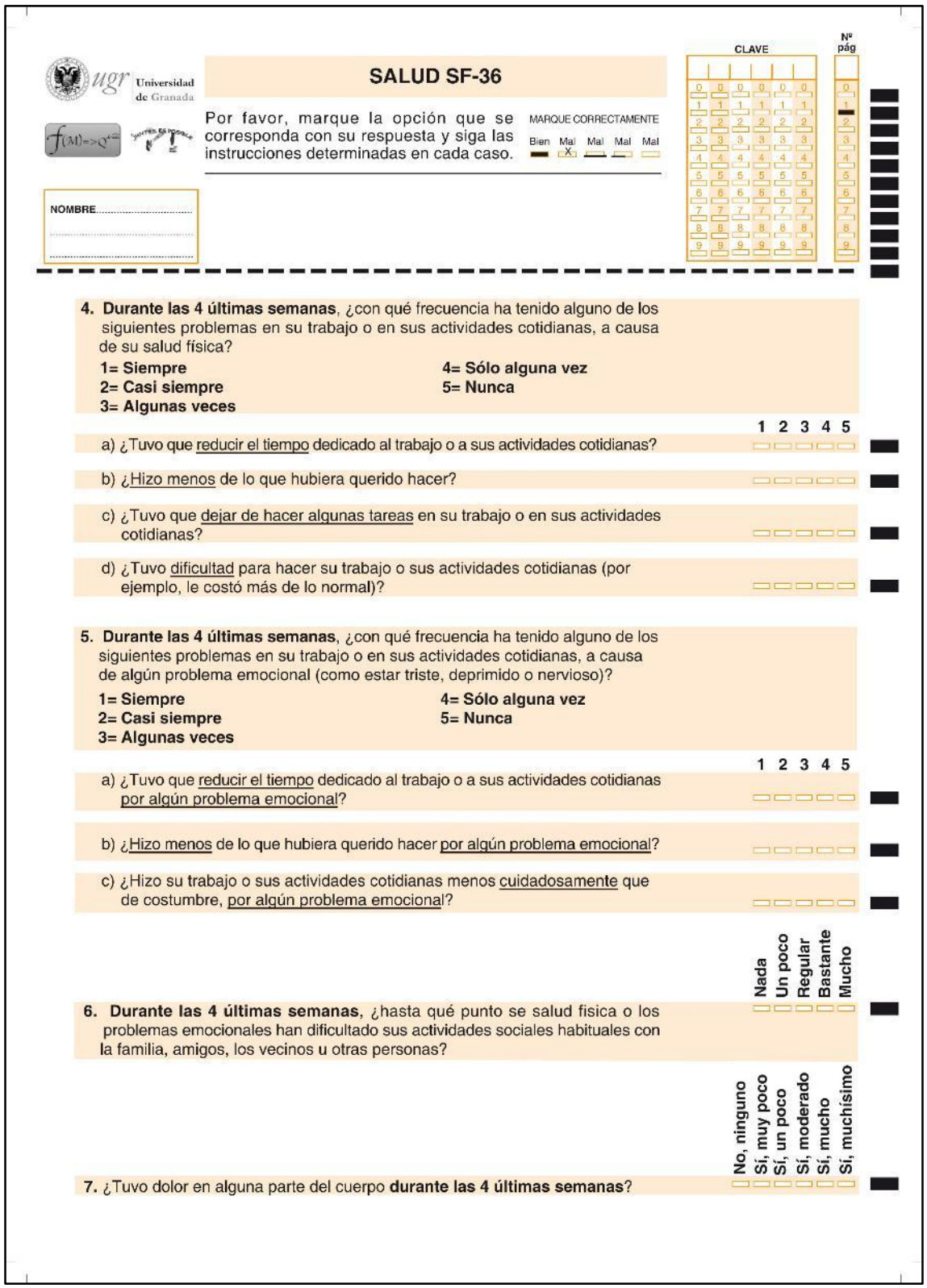
	1	2	3	4	5
2. ¿Cómo diría usted que es su salud actual, comparada con la de hace un año?					

1= Mucho mejor ahora que hace un año
2= Algo mejor ahora que hace un año
3= Más o menos igual que hace un año
4= Algo peor ahora que hace un año
5= Mucho peor ahora que hace un año

Para cada una de las cuestiones siguientes, seleccionar la respuesta más adecuada. Teniendo en cuenta que:

1. Sí, me limita mucho.
2. Sí, me limita un poco.
3. No, no me limita nada.

3. Las siguientes preguntas se refieren a actividades o cosas que usted podría hacer un día normal. Su salud actual, ¿le limita para hacer esas actividades o cosas? Si es así, ¿cuánto?	1	2	3
a) Esfuerzos intensos, tales como correr, levantar objetos pesados, o participar en deportes agotadores.			
b) Esfuerzos moderados, como mover una mesa, pasar la aspiradora, jugar a los bolos o caminar más de 1 hora.			
c) Coger o llevar la bolsa de la compra.			
d) Subir varios pisos por la escalera.			
e) Subir un solo piso por la escalera.			
f) Agacharse o arrodillarse.			
g) Caminar un kilómetro o más.			
h) Caminar varios centenares de metros.			
i) Caminar unos 100 metros.			
j) Bañarse o vestirse por sí mismo.			



Universidad de Granada

SALUD SF-36

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág

NOMBRE.....

4. Durante las 4 últimas semanas, ¿con qué frecuencia ha tenido alguno de los siguientes problemas en su trabajo o en sus actividades cotidianas, a causa de su salud física?

1= Siempre
2= Casi siempre
3= Algunas veces
4= Sólo alguna vez
5= Nunca

	1	2	3	4	5
a) ¿Tuvo que reducir el tiempo dedicado al trabajo o a sus actividades cotidianas?					
b) ¿Hizo menos de lo que hubiera querido hacer?					
c) ¿Tuvo que dejar de hacer algunas tareas en su trabajo o en sus actividades cotidianas?					
d) ¿Tuvo dificultad para hacer su trabajo o sus actividades cotidianas (por ejemplo, le costó más de lo normal)?					

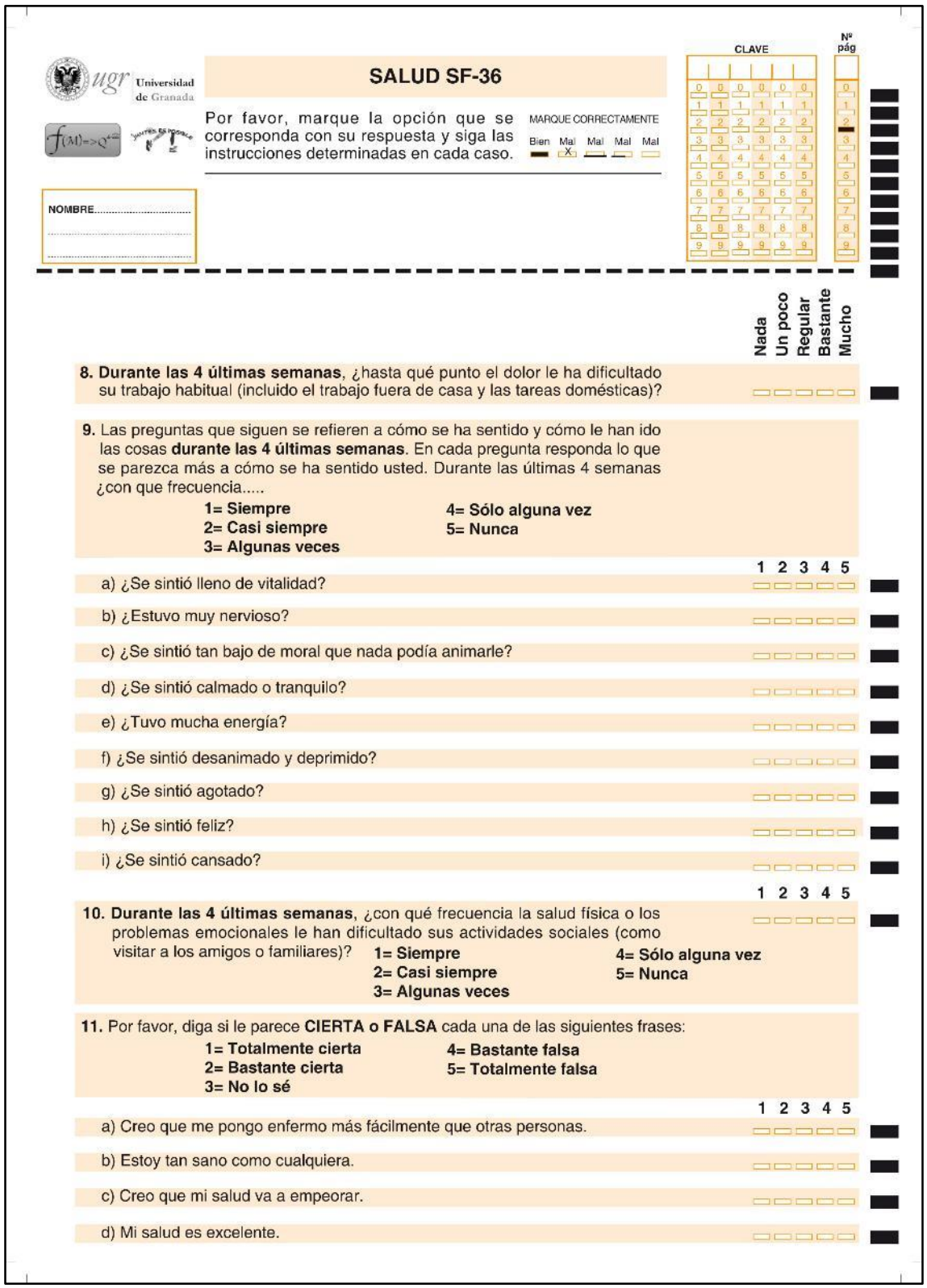
5. Durante las 4 últimas semanas, ¿con qué frecuencia ha tenido alguno de los siguientes problemas en su trabajo o en sus actividades cotidianas, a causa de algún problema emocional (como estar triste, deprimido o nervioso)?

1= Siempre
2= Casi siempre
3= Algunas veces
4= Sólo alguna vez
5= Nunca

	1	2	3	4	5
a) ¿Tuvo que reducir el tiempo dedicado al trabajo o a sus actividades cotidianas por algún problema emocional?					
b) ¿Hizo menos de lo que hubiera querido hacer por algún problema emocional?					
c) ¿Hizo su trabajo o sus actividades cotidianas menos cuidadosamente que de costumbre, por algún problema emocional?					

	Nada	Un poco	Regular	Bastante	Mucho
6. Durante las 4 últimas semanas, ¿hasta qué punto se salud fisica o los problemas emocionales han dificultado sus actividades sociales habituales con la familia, amigos, los vecinos u otras personas?					

	No, ninguno	Si, muy poco	Si, un poco	Si, moderado	Si, mucho	Si, muchísimo
7. ¿Tuvo dolor en alguna parte del cuerpo **durante las 4 últimas semanas**?						



Universidad de Granada

SALUD SF-36

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág

NOMBRE.....

	Nada	Un poco	Regular	Bastante	Mucho
8. Durante las 4 últimas semanas, ¿hasta qué punto el dolor le ha dificultado su trabajo habitual (incluido el trabajo fuera de casa y las tareas domésticas)?					

9. Las preguntas que siguen se refieren a cómo se ha sentido y cómo le han ido las cosas **durante las 4 últimas semanas**. En cada pregunta responda lo que se parezca más a cómo se ha sentido usted. Durante las últimas 4 semanas ¿con que frecuencia.....

1= Siempre **4= Sólo alguna vez**
2= Casi siempre **5= Nunca**
3= Algunas veces

	1	2	3	4	5
a) ¿Se sintió lleno de vitalidad?					
b) ¿Estuvo muy nervioso?					
c) ¿Se sintió tan bajo de moral que nada podía animarle?					
d) ¿Se sintió calmado o tranquilo?					
e) ¿Tuvo mucha energía?					
f) ¿Se sintió desanimado y deprimido?					
g) ¿Se sintió agotado?					
h) ¿Se sintió feliz?					
i) ¿Se sintió cansado?					

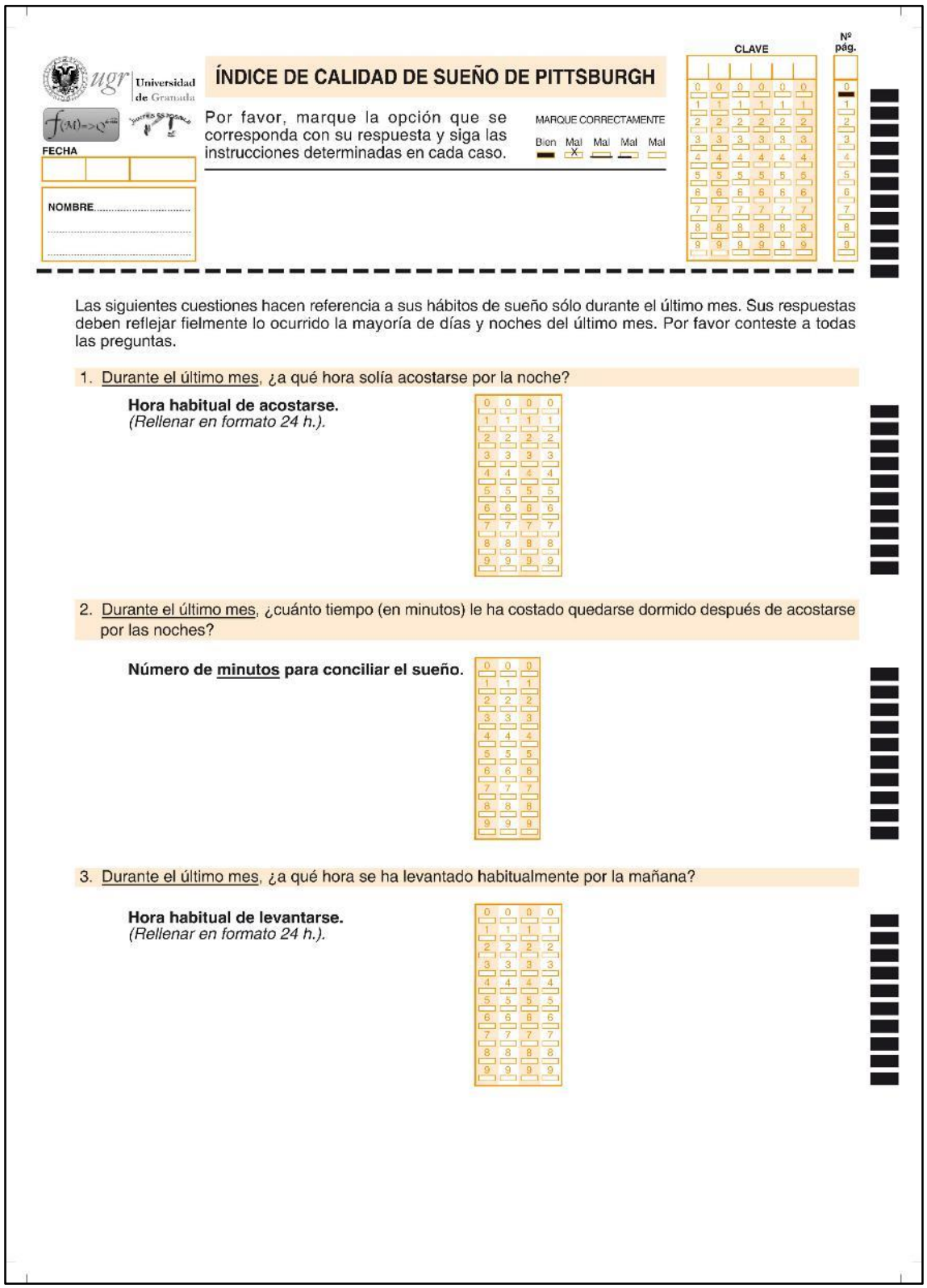
	1	2	3	4	5
10. Durante las 4 últimas semanas, ¿con qué frecuencia la salud física o los problemas emocionales le han dificultado sus actividades sociales (como visitar a los amigos o familiares)? **1= Siempre** **2= Casi siempre** **3= Algunas veces** **4= Sólo alguna vez** **5= Nunca**					

11. Por favor, diga si le parece **CIERTA o FALSA** cada una de las siguientes frases:

1= Totalmente cierta **4= Bastante falsa**
2= Bastante cierta **5= Totalmente falsa**
3= No lo sé

	1	2	3	4	5
a) Creo que me pongo enfermo más fácilmente que otras personas.					
b) Estoy tan sano como cualquiera.					
c) Creo que mi salud va a empeorar.					
d) Mi salud es excelente.					

Annexe 7. Pittsburgh Sleep Quality Index (Study IV).



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ÍNDICE DE CALIDAD DE SUEÑO DE PITTSBURGH

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág.

FECHA

NOMBRE.....

Las siguientes cuestiones hacen referencia a sus hábitos de sueño sólo durante el último mes. Sus respuestas deben reflejar fielmente lo ocurrido la mayoría de días y noches del último mes. Por favor conteste a todas las preguntas.

1. Durante el último mes, ¿a qué hora solía acostarse por la noche?

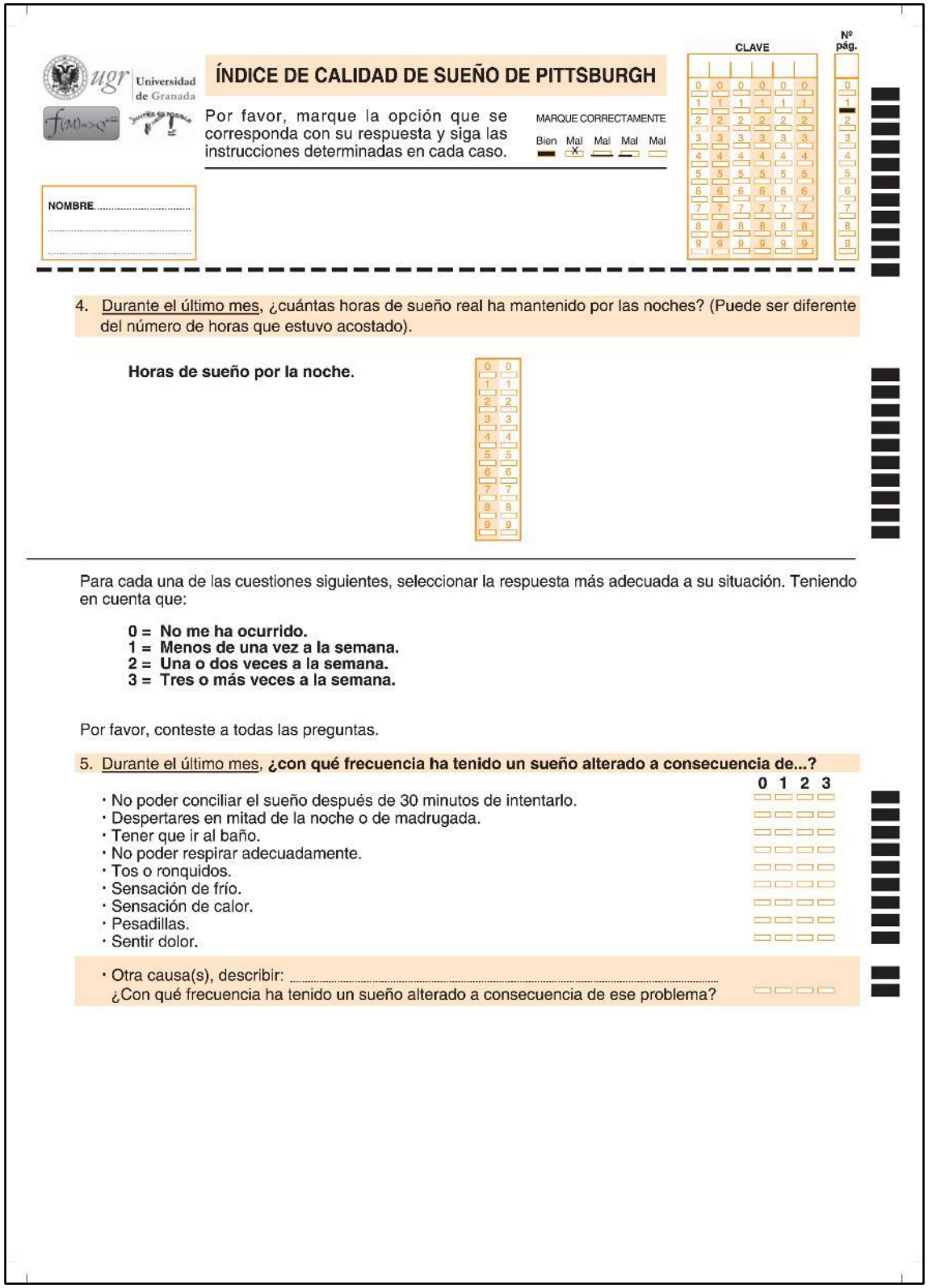
Hora habitual de acostarse.
(Rellenar en formato 24 h.).

2. Durante el último mes, ¿cuánto tiempo (en minutos) le ha costado quedarse dormido después de acostarse por las noches?

Número de minutos para conciliar el sueño.

3. Durante el último mes, ¿a qué hora se ha levantado habitualmente por la mañana?

Hora habitual de levantarse.
(Rellenar en formato 24 h.).



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ÍNDICE DE CALIDAD DE SUEÑO DE PITTSBURGH

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal (X) | Mal | Mal | Mal

CLAVE

Nº pág.

NOMBRE.....

4. Durante el último mes, ¿cuántas horas de sueño real ha mantenido por las noches? (Puede ser diferente del número de horas que estuvo acostado).

Horas de sueño por la noche.

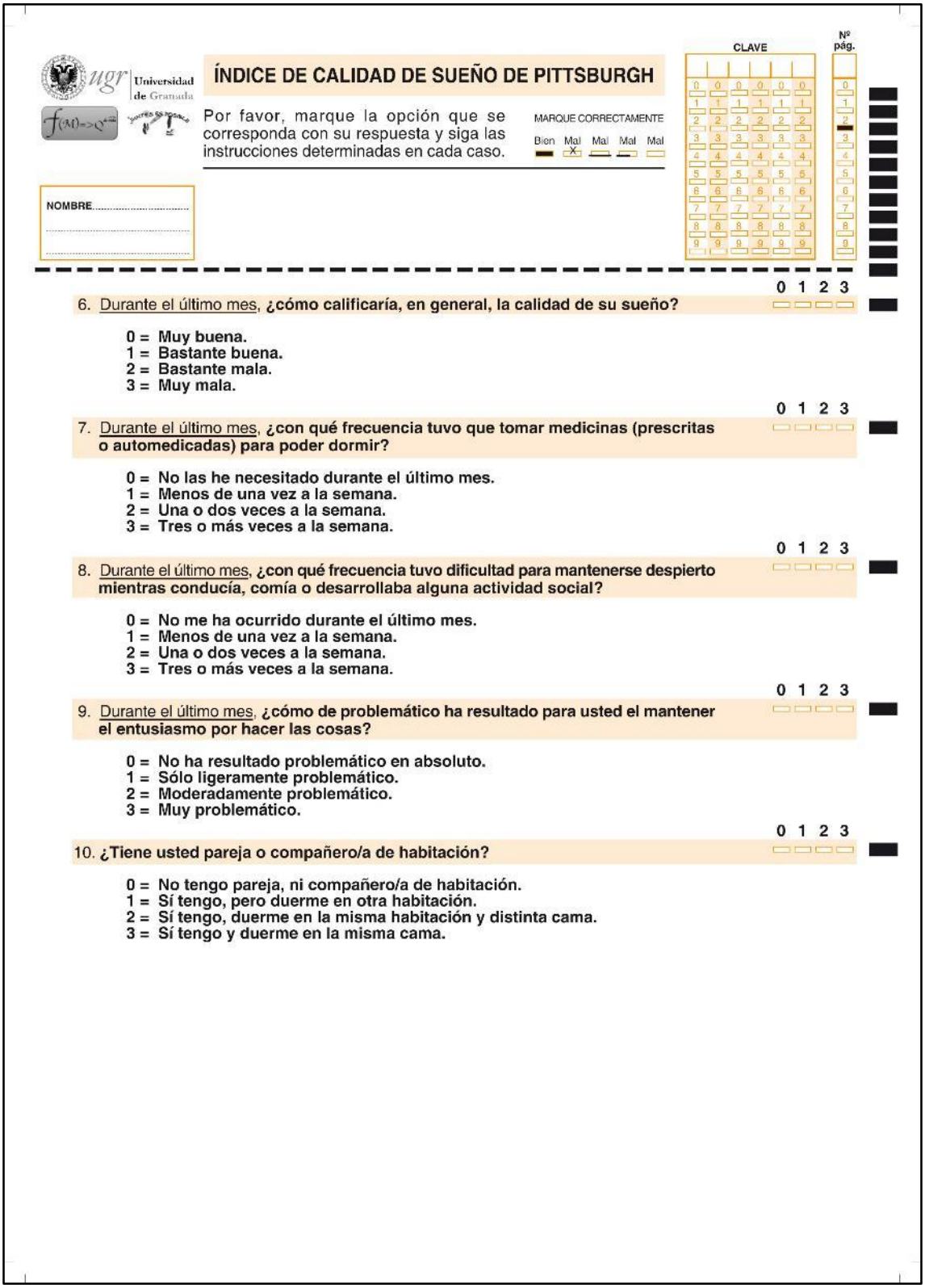
Para cada una de las cuestiones siguientes, seleccionar la respuesta más adecuada a su situación. Teniendo en cuenta que:

0 = No me ha ocurrido.
1 = Menos de una vez a la semana.
2 = Una o dos veces a la semana.
3 = Tres o más veces a la semana.

Por favor, conteste a todas las preguntas.

5. Durante el último mes, **¿con qué frecuencia ha tenido un sueño alterado a consecuencia de...?**

	0	1	2	3
· No poder conciliar el sueño después de 30 minutos de intentarlo.				
· Despertares en mitad de la noche o de madrugada.				
· Tener que ir al baño.				
· No poder respirar adecuadamente.				
· Tos o ronquidos.				
· Sensación de frío.				
· Sensación de calor.				
· Pesadillas.				
· Sentir dolor.				
· Otra causa(s), describir: ..... ¿Con qué frecuencia ha tenido un sueño alterado a consecuencia de ese problema?				



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ÍNDICE DE CALIDAD DE SUEÑO DE PITTSBURGH

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág.

NOMBRE.....

.....

.....

0 1 2 3

6. Durante el último mes, **¿cómo calificaría, en general, la calidad de su sueño?**

0 = Muy buena.
1 = Bastante buena.
2 = Bastante mala.
3 = Muy mala.

0 1 2 3

7. Durante el último mes, **¿con qué frecuencia tuvo que tomar medicinas (prescritas o automedicadas) para poder dormir?**

0 = No las he necesitado durante el último mes.
1 = Menos de una vez a la semana.
2 = Una o dos veces a la semana.
3 = Tres o más veces a la semana.

0 1 2 3

8. Durante el último mes, **¿con qué frecuencia tuvo dificultad para mantenerse despierto mientras conducía, comía o desarrollaba alguna actividad social?**

0 = No me ha ocurrido durante el último mes.
1 = Menos de una vez a la semana.
2 = Una o dos veces a la semana.
3 = Tres o más veces a la semana.

0 1 2 3

9. Durante el último mes, **¿cómo de problemático ha resultado para usted el mantener el entusiasmo por hacer las cosas?**

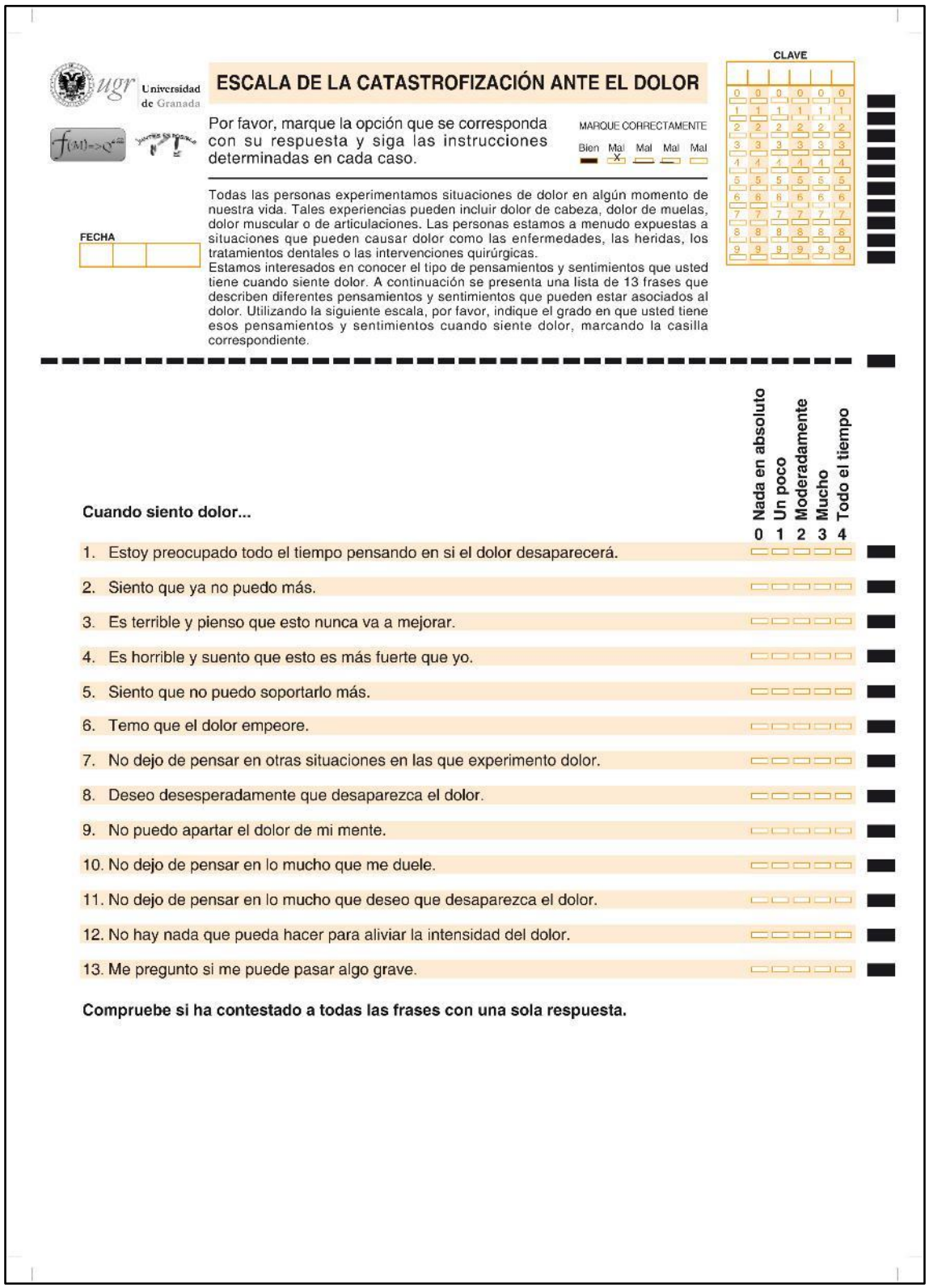
0 = No ha resultado problemático en absoluto.
1 = Sólo ligeramente problemático.
2 = Moderadamente problemático.
3 = Muy problemático.

0 1 2 3

10. **¿Tiene usted pareja o compañero/a de habitación?**

0 = No tengo pareja, ni compañero/a de habitación.
1 = Sí tengo, pero duerme en otra habitación.
2 = Sí tengo, duerme en la misma habitación y distinta cama.
3 = Sí tengo y duerme en la misma cama.

Annexe 8. Pain Catastrophizing Scale (Study IV).



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ESCALA DE LA CATASTROFIZACIÓN ANTE EL DOLOR

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE: Bien | Mal (x) | Mal | Mal | Mal

CLAVE

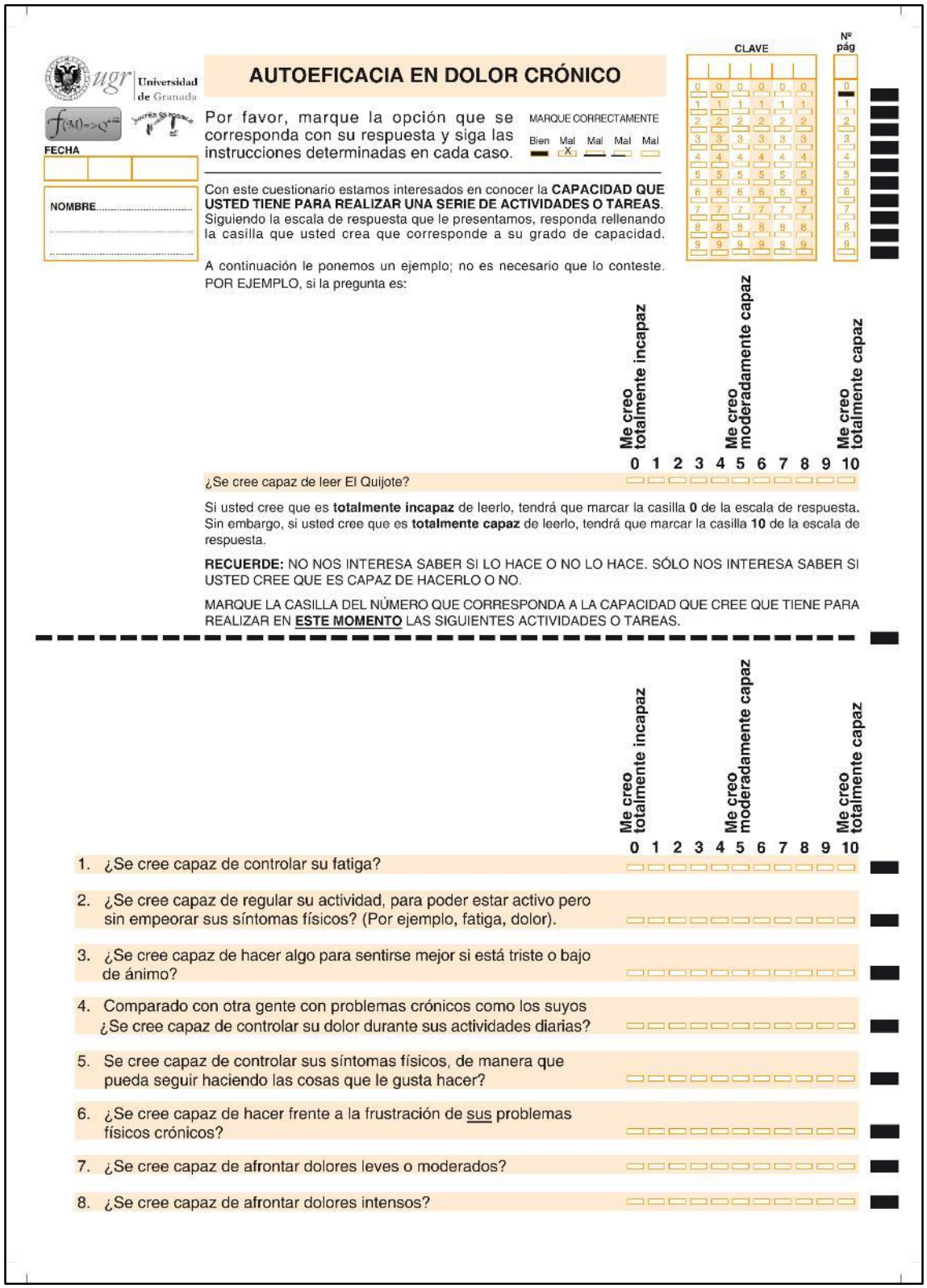
FECHA

Todas las personas experimentamos situaciones de dolor en algún momento de nuestra vida. Tales experiencias pueden incluir dolor de cabeza, dolor de muelas, dolor muscular o de articulaciones. Las personas estamos a menudo expuestas a situaciones que pueden causar dolor como las enfermedades, las heridas, los tratamientos dentales o las intervenciones quirúrgicas.
Estamos interesados en conocer el tipo de pensamientos y sentimientos que usted tiene cuando siente dolor. A continuación se presenta una lista de 13 frases que describen diferentes pensamientos y sentimientos que pueden estar asociados al dolor. Utilizando la siguiente escala, por favor, indique el grado en que usted tiene esos pensamientos y sentimientos cuando siente dolor, marcando la casilla correspondiente.

Cuando siento dolor...	Nada en absoluto 0	Un poco 1	Moderadamente 2	Mucho 3	Todo el tiempo 4
1. Estoy preocupado todo el tiempo pensando en si el dolor desaparecerá.					
2. Siento que ya no puedo más.					
3. Es terrible y pienso que esto nunca va a mejorar.					
4. Es horrible y suento que esto es más fuerte que yo.					
5. Siento que no puedo soportarlo más.					
6. Temo que el dolor empeore.					
7. No dejo de pensar en otras situaciones en las que experimento dolor.					
8. Deseo desesperadamente que desaparezca el dolor.					
9. No puedo apartar el dolor de mi mente.					
10. No dejo de pensar en lo mucho que me duele.					
11. No dejo de pensar en lo mucho que deseo que desaparezca el dolor.					
12. No hay nada que pueda hacer para aliviar la intensidad del dolor.					
13. Me pregunto si me puede pasar algo grave.					

Compruebe si ha contestado a todas las frases con una sola respuesta.

Annexe 9. Chronic Pain Self-efficacy Scale (Study IV).



Universidad de Granada

FECHA

NOMBRE.....

AUTOEFICACIA EN DOLOR CRÓNICO

CLAVE

Nº pág

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien Mal Mal Mal Mal

Con este cuestionario estamos interesados en conocer la **CAPACIDAD QUE USTED TIENE PARA REALIZAR UNA SERIE DE ACTIVIDADES O TAREAS**. Siguiendo la escala de respuesta que le presentamos, responda rellenando la casilla que usted crea que corresponde a su grado de capacidad.

A continuación le ponemos un ejemplo; no es necesario que lo conteste.
POR EJEMPLO, si la pregunta es:

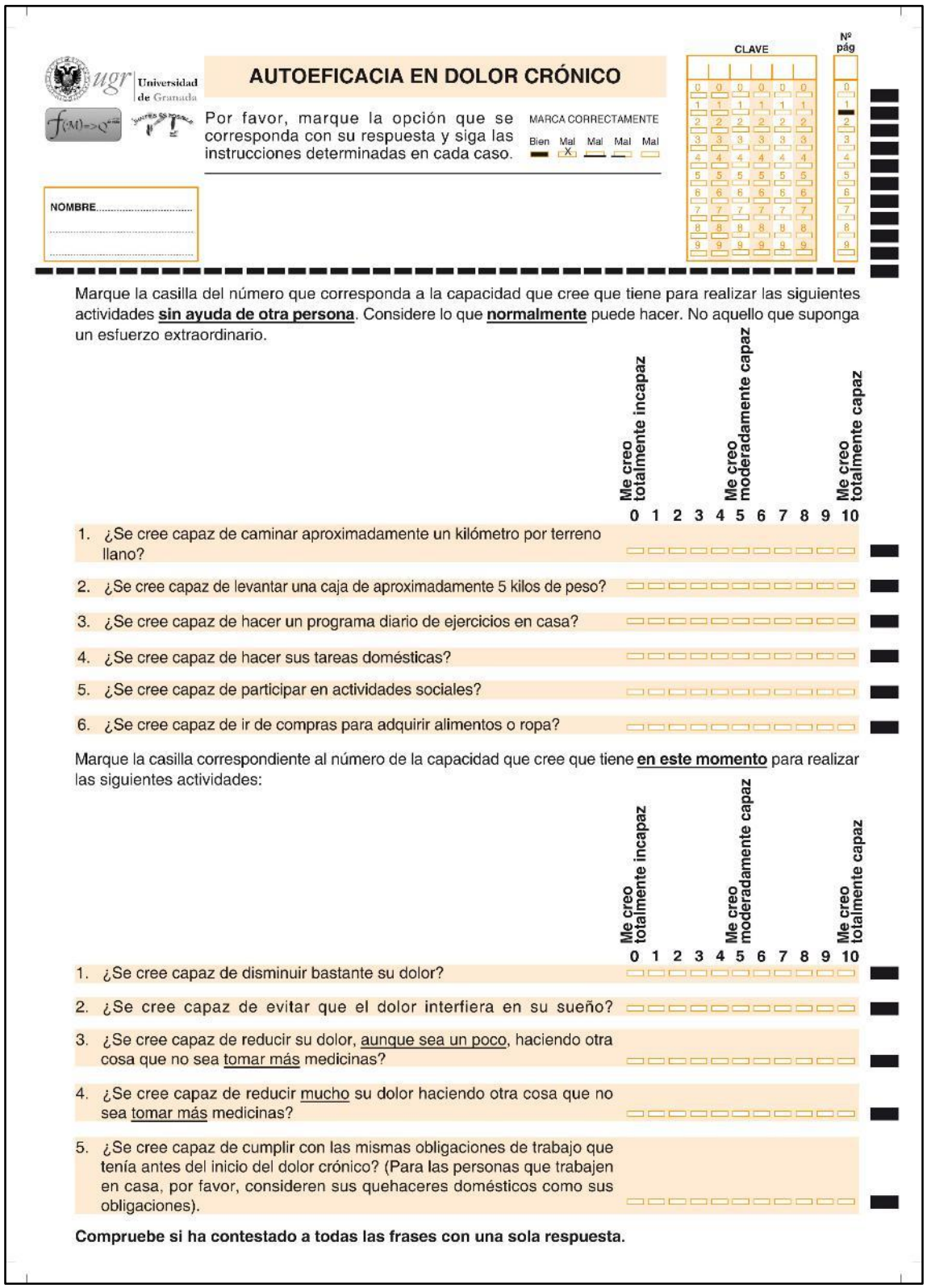
	Me creo totalmente incapaz					Me creo moderadamente capaz					Me creo totalmente capaz
	0	1	2	3	4	5	6	7	8	9	10
¿Se cree capaz de leer El Quijote?											

Si usted cree que es **totalmente incapaz** de leerlo, tendrá que marcar la casilla **0** de la escala de respuesta. Sin embargo, si usted cree que es **totalmente capaz** de leerlo, tendrá que marcar la casilla **10** de la escala de respuesta.

RECUERDE: NO NOS INTERESA SABER SI LO HACE O NO LO HACE. SÓLO NOS INTERESA SABER SI USTED CREE QUE ES CAPAZ DE HACERLO O NO.

MARQUE LA CASILLA DEL NÚMERO QUE CORRESPONDA A LA CAPACIDAD QUE CREE QUE TIENE PARA REALIZAR EN **ESTE MOMENTO** LAS SIGUIENTES ACTIVIDADES O TAREAS.

	Me creo totalmente incapaz					Me creo moderadamente capaz					Me creo totalmente capaz
	0	1	2	3	4	5	6	7	8	9	10
1. ¿Se cree capaz de controlar su fatiga?											
2. ¿Se cree capaz de regular su actividad, para poder estar activo pero sin empeorar sus síntomas físicos? (Por ejemplo, fatiga, dolor).											
3. ¿Se cree capaz de hacer algo para sentirse mejor si está triste o bajo de ánimo?											
4. Comparado con otra gente con problemas crónicos como los suyos ¿Se cree capaz de controlar su dolor durante sus actividades diarias?											
5. Se cree capaz de controlar sus síntomas físicos, de manera que pueda seguir haciendo las cosas que le gusta hacer?											
6. ¿Se cree capaz de hacer frente a la frustración de sus problemas físicos crónicos?											
7. ¿Se cree capaz de afrontar dolores leves o moderados?											
8. ¿Se cree capaz de afrontar dolores intensos?											



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AUTOEFICACIA EN DOLOR CRÓNICO

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARCA CORRECTAMENTE: Bien | Mal | Mal | Mal | Mal

CLAVE

Nº pág

NOMBRE.....

Marque la casilla del número que corresponda a la capacidad que cree que tiene para realizar las siguientes actividades **sin ayuda de otra persona**. Considere lo que **normalmente** puede hacer. No aquello que suponga un esfuerzo extraordinario.

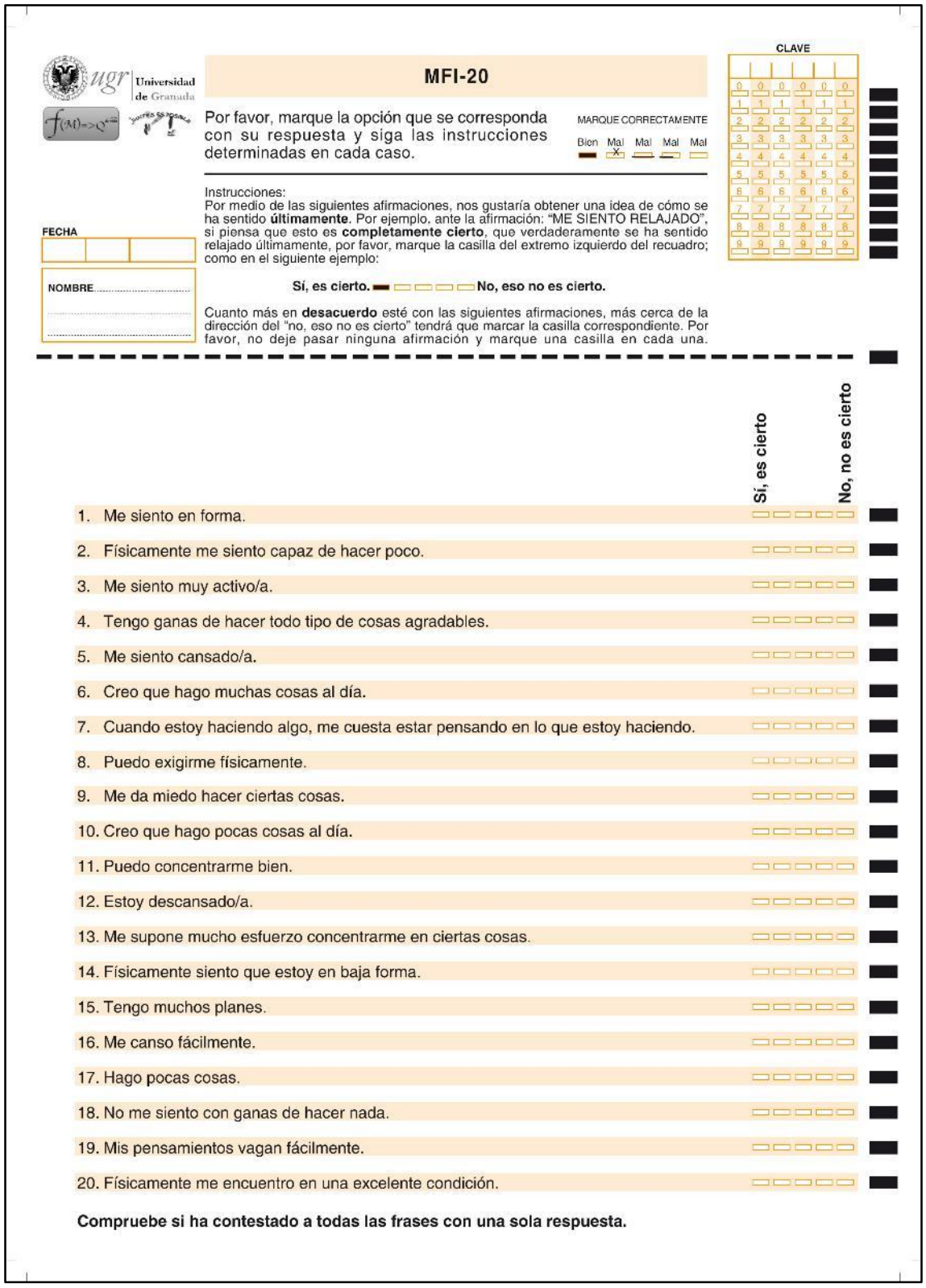
	Me creo totalmente incapaz 0	1	2	3	4	Me creo moderadamente capaz 5	6	7	8	9	Me creo totalmente capaz 10
1. ¿Se cree capaz de caminar aproximadamente un kilómetro por terreno llano?											
2. ¿Se cree capaz de levantar una caja de aproximadamente 5 kilos de peso?											
3. ¿Se cree capaz de hacer un programa diario de ejercicios en casa?											
4. ¿Se cree capaz de hacer sus tareas domésticas?											
5. ¿Se cree capaz de participar en actividades sociales?											
6. ¿Se cree capaz de ir de compras para adquirir alimentos o ropa?											

Marque la casilla correspondiente al número de la capacidad que cree que tiene **en este momento** para realizar las siguientes actividades:

	Me creo totalmente incapaz 0	1	2	3	4	Me creo moderadamente capaz 5	6	7	8	9	Me creo totalmente capaz 10
1. ¿Se cree capaz de disminuir bastante su dolor?											
2. ¿Se cree capaz de evitar que el dolor interfiera en su sueño?											
3. ¿Se cree capaz de reducir su dolor, aunque sea un poco, haciendo otra cosa que no sea tomar más medicinas?											
4. ¿Se cree capaz de reducir mucho su dolor haciendo otra cosa que no sea tomar más medicinas?											
5. ¿Se cree capaz de cumplir con las mismas obligaciones de trabajo que tenía antes del inicio del dolor crónico? (Para las personas que trabajen en casa, por favor, consideren sus quehaceres domésticos como sus obligaciones).											

Compruebe si ha contestado a todas las frases con una sola respuesta.

Annexe 10. Multidimensional Fatigue Inventory (Study IV).



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MFI-20

Por favor, marque la opción que se corresponda con su respuesta y siga las instrucciones determinadas en cada caso.

MARQUE CORRECTAMENTE

Bien Mal Mal Mal Mal

CLAVE

FECHA

NOMBRE.....

Instrucciones:
Por medio de las siguientes afirmaciones, nos gustaría obtener una idea de cómo se ha sentido **últimamente**. Por ejemplo, ante la afirmación: "ME SIENTO RELAJADO", si piensa que esto es **completamente cierto**, que verdaderamente se ha sentido relajado últimamente, por favor, marque la casilla del extremo izquierdo del recuadro; como en el siguiente ejemplo:

Sí, es cierto. **No, eso no es cierto.**

Cuanto más en **desacuerdo** esté con las siguientes afirmaciones, más cerca de la dirección del "no, eso no es cierto" tendrá que marcar la casilla correspondiente. Por favor, no deje pasar ninguna afirmación y marque una casilla en cada una.

	Sí, es cierto				No, no es cierto
1. Me siento en forma.					
2. Físicamente me siento capaz de hacer poco.					
3. Me siento muy activo/a.					
4. Tengo ganas de hacer todo tipo de cosas agradables.					
5. Me siento cansado/a.					
6. Creo que hago muchas cosas al día.					
7. Cuando estoy haciendo algo, me cuesta estar pensando en lo que estoy haciendo.					
8. Puedo exigirme físicamente.					
9. Me da miedo hacer ciertas cosas.					
10. Creo que hago pocas cosas al día.					
11. Puedo concentrarme bien.					
12. Estoy descansado/a.					
13. Me supone mucho esfuerzo concentrarme en ciertas cosas.					
14. Físicamente siento que estoy en baja forma.					
15. Tengo muchos planes.					
16. Me canso fácilmente.					
17. Hago pocas cosas.					
18. No me siento con ganas de hacer nada.					
19. Mis pensamientos vagan fácilmente.					
20. Físicamente me encuentro en una excelente condición.					

Compruebe si ha contestado a todas las frases con una sola respuesta.

Annexe 11. Electronic search for the studies including: database, number of references found and terms included (Study V).

The electronic search was conducted through August 22nd 2013. Three categories of search terms were identified: 1) Questionnaire, 2) Commuting to school and, 3) Age. Relevant publications that contained at least one term from each of the 3 categories in the full text were identified. Moreover, use of the search term, *school*, was restricted to title and abstract to avoid its inclusion in the author's affiliation. The following terms were used for each category:

1) Questionnaire: *"Question*" OR "Survey" OR "Self-Reported" AND*
2) Commuting to school: *"Travel" OR "Commuting" OR "Commute*" OR "Walkability" OR "Active transportation" AND*
3) Age: *"child*" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*
4) School: *"*school*"[Title/Abstrac]*

The electronic search was conducted in 5 databases:

1) PubMed: 121 studies.

"Question" OR "Survey" OR "Self-Reported" AND*

"Travel" OR "Commuting" OR "Commute" OR "Walkability" OR "Active transportation" AND*

"child" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*

*"*school*"[Title/Abstract]*

2) SportDiscus: 70 studies, only in scientific journals.

"Question" OR "Survey" OR "Self-Reported" AND*

"Travel" OR "Commuting" OR "Commute" OR "Walkability" OR "Active transportation" AND*

"child" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*

*TI("*school*") OR AB("*school*")*

3) ProQuest: 4,924 studies, only in scientific journals.

"Question" OR "Survey" OR "Self-Reported" AND*

"Travel" OR "Commuting" OR "Commute" OR "Walkability" OR "Active transportation" AND*

"child" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*

*ti("*school*") OR ab("*school*")*

4) National Transportation Library: 391 studies.

"Question" OR "Survey" OR "Self-Reported" AND*

"Travel" OR "Commuting" OR "Commute" OR "Walkability" OR "Active transportation" AND*

"child" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*

*ti("*school*") OR ab("*school*")*

5) Web of Knowledge: 392 studies.

"Question" OR "Survey" OR "Self-Reported" AND*

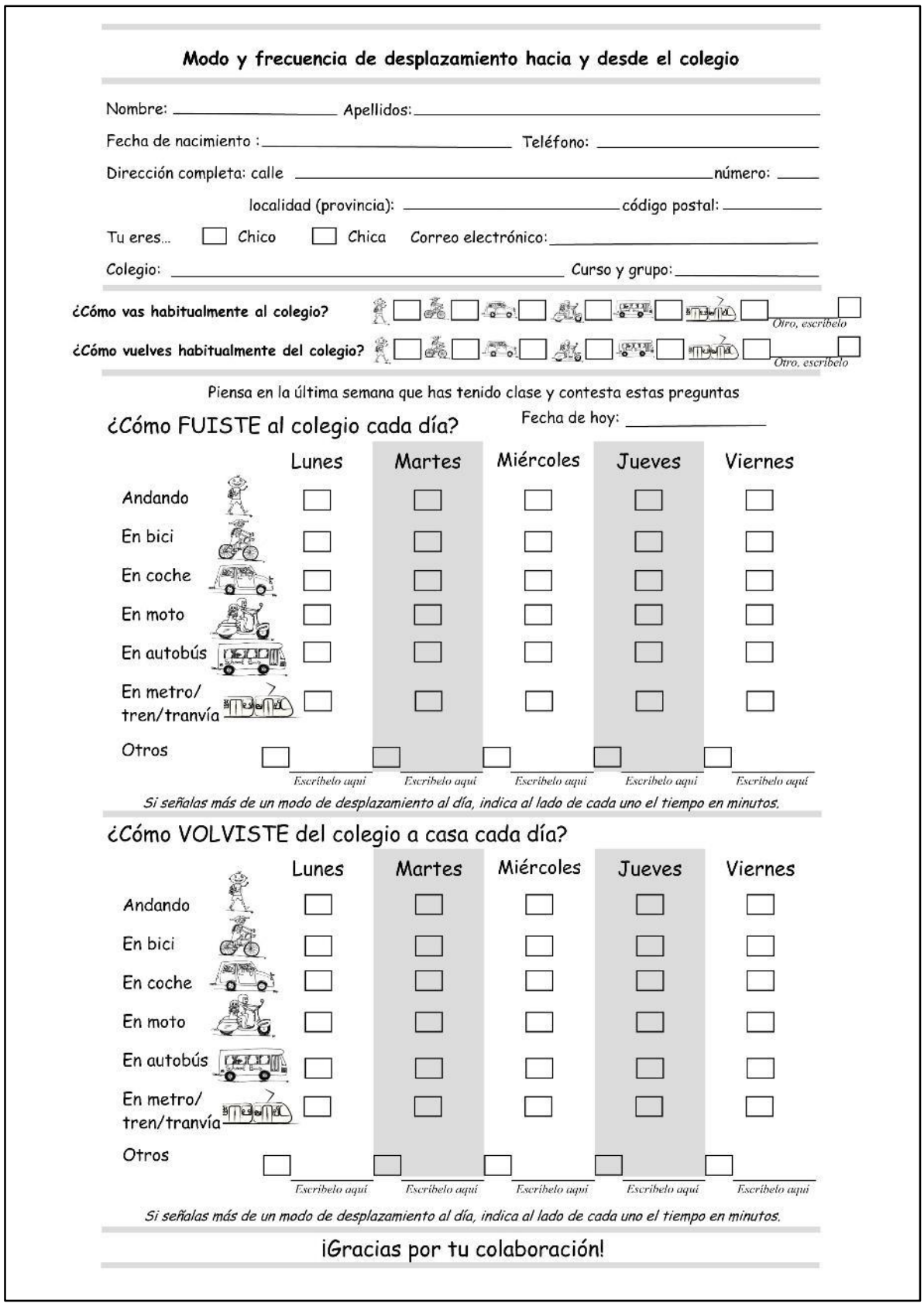
"Travel" OR "Commuting" OR "Commute" OR "Walkability" OR "Active transportation" AND*

"child" OR "Adolescent*" OR "Youth" OR "student" OR "Pupil" OR "Pupils" AND*

school

Annexe 12. Mode and Frequency of Commuting to and from School Questionnaire (Studies VI to VIII).

Spanish version



Modo y frecuencia de desplazamiento hacia y desde el colegio

Nombre: _____ Apellidos: _____

Fecha de nacimiento : _____ Teléfono: _____

Dirección completa: calle _____ número: _____

localidad (provincia): _____ código postal: _____

Tu eres... ☐ Chico ☐ Chica Correo electrónico: _____

Colegio: _____ Curso y grupo: _____

¿Cómo vas habitualmente al colegio? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ *Otro, escríbelo*

¿Cómo vuelves habitualmente del colegio? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ *Otro, escríbelo*

Piensa en la última semana que has tenido clase y contesta estas preguntas

¿Cómo FUISTE al colegio cada día? Fecha de hoy: _____

	Lunes	Martes	Miércoles	Jueves	Viernes
Andando	☐	☐	☐	☐	☐
En bici	☐	☐	☐	☐	☐
En coche	☐	☐	☐	☐	☐
En moto	☐	☐	☐	☐	☐
En autobús	☐	☐	☐	☐	☐
En metro/ tren/tranvía	☐	☐	☐	☐	☐
Otros	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*

Si señalas más de un modo de desplazamiento al día, indica al lado de cada uno el tiempo en minutos.

¿Cómo VOLVISTE del colegio a casa cada día?

	Lunes	Martes	Miércoles	Jueves	Viernes
Andando	☐	☐	☐	☐	☐
En bici	☐	☐	☐	☐	☐
En coche	☐	☐	☐	☐	☐
En moto	☐	☐	☐	☐	☐
En autobús	☐	☐	☐	☐	☐
En metro/ tren/tranvía	☐	☐	☐	☐	☐
Otros	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*	☐ *Escríbelo aquí*

Si señalas más de un modo de desplazamiento al día, indica al lado de cada uno el tiempo en minutos.

¡Gracias por tu colaboración!

English version

Mode and frequency of commuting to and from school

First name: _____ Last name: _____

Date of birth : _____ Phone number: _____

Postal address: _____

Town: _____ Postcode: _____

You are... ☐ Male ☐ Female E-mail: _____

School name: _____ School Year: _____

How do you usually get to school? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ _____ ☐ *Other, write it*

How do you usually get home from school? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ _____ ☐ *Other, write it*

Thinking about the last school week, answer these questions.

How did you get to school each day?

Date: _____

	Monday	Tuesday	Wednesday	Thursday	Friday
Walking	☐	☐	☐	☐	☐
Cycling	☐	☐	☐	☐	☐
Car	☐	☐	☐	☐	☐
Motorcycle	☐	☐	☐	☐	☐
Bus	☐	☐	☐	☐	☐
Underground Train/Tram	☐	☐	☐	☐	☐
Other	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*

If you select more than one mode of commuting per day, write beside each mode the journey time in minutes.

How did you get home from school each day?

	Monday	Tuesday	Wednesday	Thursday	Friday
Walking	☐	☐	☐	☐	☐
Cycling	☐	☐	☐	☐	☐
Car	☐	☐	☐	☐	☐
Motorcycle	☐	☐	☐	☐	☐
Bus	☐	☐	☐	☐	☐
Underground Train/Tram	☐	☐	☐	☐	☐
Other	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*	☐ *Write it here*

If you select more than one mode of commuting per day, write beside each mode the journey time in minutes.

Thank you for your help!

Annexe 13. Commuting to school questionnaire (Study IX).

PROYECTO CAMINOS ESCOLARES SEGUROS_SALOBREÑA

PARTICIPACIÓN DE LOS NIÑOS EN EL PROYECTO DE CAMINOS ESCOLARES SEGUROS-ENCUESTA

¿Qué opináis los niños?

Estamos intentando saber la forma en que vais cada día al cole. Entre todos, padres, profes y técnicos queremos inventar caminos seguros para vosotros, por los cuales podáis ir con los amigos al cole, sin correr peligro. Pero para ello, necesitamos que nos contéis algunas cosas.

Lee detenidamente estas preguntas que hay a continuación en voz alta, con la ayuda del profesor/a y cuando estén perfectamente entendidas, marcad la opción que os corresponde

¡ojo, es individual, y hay que decir SIEMRPE LA VERDAD!

1.- Nombre y apellidos:

2.- ¿En qué clase estás?

3.-¿Dónde vives? Pon tu dirección si la sabes:

4.- ¿Cuánto tiempo crees que tardas de casa al colegio?

5.- ¿Sabes qué distancia hay más o menos, de casa al colegio?

6.- ¿Cómo vas al cole?

- ☐ A pié
- ☐ En coche
- ☐ En bici
- ☐ En moto

7.- Si no vas al cole andando, ¿por qué crees que es? Marca todas las respuestas necesarias

- ☐ Está muy lejos
- ☐ Tardaría mucho
- ☐ Hay mucho tráfico
- ☐ No hay aceras o la calle está muy mal
- ☐ Me daría un poco de miedo (a perderme, a que me pase algo, no conozco bien el camino ...)
- ☐ Mis padres no me dejan aunque yo quiera
- ☐ Es muy cansado
- ☐ Otros:

8.- ¿Cómo te lo pasas de camino al cole?

- ☐ Muy bien, es agradable
- ☐ Ni bien ni mal
- ☐ Mal

PROYECTO CAMINOS ESCOLARES SEGUROS_SALOBREÑA

9.- Si has dicho mal ¿qué es lo que no te gusta? _____

_____

10.- Si has dicho bien ¿qué es lo que te gusta? _____

_____

11.- ¿Con quién vas al cole?

- ☐ Con alguno de mis padres
- ☐ Con mis amigos
- ☐ Con alguno de mis abuelos
- ☐ Yo solo o sola
- ☐ Con vecinos

12.- ¿Con quién te gustaría ir al cole?

- ☐ Con alguno de mis padres
- ☐ Con mis amigos
- ☐ Con alguno de mis abuelos
- ☐ Yo solo o sola
- ☐ Con vecinos

13.- ¿Por qué? _____

_____

14.- ¿Cómo te gustaría ir al cole?

- ☐ A pié
- ☐ En coche
- ☐ En bici
- ☐ En moto

15.- ¿Por qué? _____

_____

16.- ¿Crees que es seguro para ti ir solo al cole?

☐ Si ☐ No

17.- Si has dicho que no es seguro, cuéntanos qué problemas o peligros crees que hay en ese camino.

GRACIAS!!

Even if I knew that tomorrow the world
would go to pieces, I would still plant my apple tree.
(Martin Luther King, Jr.)

INTERNATIONAL DOCTORAL THESIS 2017

ABSTRACT

Sedentariness and physical inactivity is growing around the world population. Active commuting behaviours (i.e. traveling to local common destinations by active means such as walking or cycling) appear as a source to increase physical activity levels. This behaviour is easily incorporable to daily routines and present more benefits apart from the physical activity increase (e.g. social or environmental benefits). Therefore, the aims of this Doctoral Thesis are to develop instruments to assess this behaviour and to understand which characteristics are more favourable to commute actively in women with fibromyalgia and young people.

The results of this Doctoral Thesis provide tools to assess and to enhance our understanding about active commuting behaviours in fibromyalgia women (regarding socioeconomic factors, physical activity and symptomatology) and in young people (regarding to the influence of weather, accompaniment and safety perception). These results will lead us to future research in which intervention strategies to encourage active commuting could be more accurate.

UNIVERSITY OF GRANADA
FACULTY OF SPORT SCIENCES