Gender and school-stage associations with health-related behaviours and health-related quality of life in Spanish children

Emily C. L. Knox\textsuperscript{a} and José J. Muros\textsuperscript{b,c}

\textsuperscript{a}School of Health Sciences, Queens Medical Centre, The University of Nottingham, Nottingham, UK; \textsuperscript{b}Department of Nutrition and Food Science, University of Granada, Granada, Spain; \textsuperscript{c}School of Medicine, Queens Medical Centre, The University of Nottingham, Nottingham, UK

\textbf{ABSTRACT}

During adolescence individuals experience a number of cognitive, physical, psychological and emotional changes which can impinge on their health and wellbeing. The aim of this study was to identify associations with five components of health-related quality of life (HRQoL) in children. Data were collected from 456 children attending one of five schools in Granada, Spain in a cross-sectional design. Females reported engaging in less physical activity than males. Females reported lower HRQoL in terms of lower physical wellbeing, family relationships and autonomy and perceived school environment in secondary school. Males only reported lower perceptions of their school environment in secondary school. Physical activity was strongly associated with HRQoL, whereas Mediterranean diet was not. Physical activity interventions should be prioritised when positive HRQoL of children is a main target. Special consideration should be given to support the positive development of females, especially during the early years of secondary school.

\textbf{KEYWORDS}

Mediterranean diet; physical activity; childhood; health-related quality of life; mental health; school

\textbf{Introduction}

Around five per cent of Spanish children and adolescents suffer from a mental health disorder (Braddick, Carral, Jenkins, & Jane-Llopis, 2009; Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014a); and it is estimated that around 20\% will encounter some form of mental health disorder at some point during their adolescence (Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014a). For these reasons, the mental health of young people is a national priority in Spain (Ministerio de Sanidad & Servicios Sociales e Igualdad, 2014b) and across Europe (World Health Organization, 2015).

Many factors can contribute to the reported mental health issues within young people. One possible factor is poor health-related quality of life (HRQoL) (Svedberg, Eriksson, & Boman, 2013). HRQoL is a broad and multidimensional construct concerning a person’s subjective evaluation of their felt physical, social and emotional wellbeing, thereby influencing mental health (Solans et al., 2008).
During adolescence individuals experience a number of cognitive, physical, psychological and emotional changes which can impinge on their health and wellbeing (Patton & Viner, 2007). Leaving primary school and moving to secondary school can be a particularly challenging time for many young people (Dismore & Bailey, 2010; Martínez, Aricak, Graves, Peters-Myszak, & Nellis, 2011; West, Sweeting, & Young, 2010). This makes the transitional period i.e. the final years of primary school and the early years of secondary school, an important life stage to examine. Further, previous research has suggested that females are at greater risk of experiencing low HRQoL than males (Meade & Dowswell, 2016; Svedberg et al., 2013). Gender differences should therefore also be explored in relation to HRQoL during the transitional period.

Considering the burgeoning prevalence of mental health issues within young people and the substantial costs it poses to all of society (The EU Contribution to the World Mental Health Surveys & Executive Agency for Health and Consumers, 2011) it is important for research to identify potential interventions. Further, with investment in mental health conditions lagging significantly behind that for somatic conditions it is prudent to uncover interventions with the potential for prevention and not just treatment (Trautmann, Rehm, & Wittchen, 2016). Previous research suggests that physical activity is directly associated with HRQoL, with a potential role in both prevention and treatment (Breslin et al., 2012). Lifestyle interventions could, therefore, be used to target improvements in HRQoL (Gillison, Standage, & Skevington, 2008). There is a known reduction in engagement in healthful behaviours, such as physical activity, during the school transition period making it particularly important to examine within this population (De Meester, Van Dyck, De Bourdeaudhuij, Deforche, & Cardon, 2014; Knowles, Niven, & Fawkner, 2011). More sensitive information about the association of different components of HRQoL with physical activity would help to inform more effective development of interventions.

The aim of the present study was therefore to identify gender differences in physical activity adherence and five components of HRQoL, between adolescents attending primary school and adolescents attending secondary school in Granada, Spain. Mediterranean diet adherence was also investigated as a further lifestyle behaviour due to its cultural relevance within this population. Given prior evidence of female susceptibility to poor mental health a secondary aim was to identify predictors of HRQoL across genders and school stage, with a view to informing the direction of future lifestyle interventions during an impressionable life stage.

**Methods**

**Participants**

A cross-sectional study was carried out during the scholar year 2014/2015. Young people aged 11–14 years, belonging to five schools in the city of Granada, Spain, were invited to take part in the study. Participating schools were selected using cluster randomisation of the 55 public schools in Granada and included both primary schools and secondary schools. All participating schools were in a medium-high socioeconomic area based on information contained in the Educational Project of the centre School. A total of 511 students were selected and invited to take part in this study. An information pack was provided to the student to take home to their parents or guardians. Both the student and their parents or
guardians were informed of the objectives and methods of the study and told that they could withdraw at any time. From this, 480 students agreed to participate and written informed consent was received from their parent or guardian. To be included in the final sample, students had to be in either their second-to-last year of primary school, last year of primary school, first year of secondary school or second year of secondary school, attend class on the day of testing and complete all elements of testing. All data were collected in school during the participant’s regular physical education lesson. Twenty-four adolescents were excluded for failing to meet these criteria leaving a final sample of 456 students, of which 235 were girls and 221 boys. Participants were instructed on how to fill out the questionnaires and how to conduct the tests. A research assistant was also on hand to provide guidance on the completion of questionnaires and conduct physical testing. Data were collected between March and May in 2014. Ethical approval was granted by the Ethics Committee of the University of Granada. Ethical principles of the Declaration of Helsinki for medical research were adhered to.

**Health-related quality of life**

To assess the HRQoL, we used the KIDSCREEN-27 questionnaire. This instrument has been validated amongst Spanish-speaking adolescents (Molina et al., 2014). The KIDSCREEN-27 consists of 27 items across five components (physical well-being, psychological well-being, relationship with parents and autonomy support, social support and peer pressure and the school environment). Internal consistency of the subscales was between .81 and .84, and test-retest reliability ranged from .61 to .74 (The KIDSCREEN Group Europe, 2006). Higher scores indicate a higher HRQoL.

**Anthropometric measurement**

Height and weight were measured following the protocols established by the International Society for the Advancement of Kinanthropometry (Stewart, Marfell-Jones, Olds, & de Ridder, 2011) using a stadiometer (GPM, Seritex, Inc., Carlstadt, New Jersey; ±1 mm accuracy) and an electronic scale (model 707, Seca Corporation, Columbia, Maryland; ±50 g accuracy); Body mass index (BMI) was calculated as weight divided by height squared (kg/m²).

**Physical activity, maximal oxygen uptake and screen time**

Physical activity levels were evaluated using the Physical Activity Questionnaire for Older Children (PAQ-C). The PAQ-C is a self-administered questionnaire consisting of nine items rated on a five-point scale. The questionnaire provides a general measure of physical activity for 8–14-year olds with a higher score indicating higher engagement in physical activity. Respondents are asked to recall the frequency and type of physical activity they have engaged in on each of the seven days prior to completing the questionnaire. Validation studies have found the PAQ-C to be highly reliable (Saint-Maurice, Welk, Beyler, Bartee, & Heelan, 2014).

Maximal oxygen uptake (VO₂max) was estimated using a 20 m incremental maximum effort shuttle run field test (Tomkinson et al., 2016). The test involves running to and fro between two lines placed 20 m apart. Participants start at an initial velocity of 8.5 km/h and increase
their speed by .5 km/h/min, until they can no longer reach the line on two consecutive occasions or when the participant can no longer maintain the physical effort required to continue. VO$_{2\text{max}}$ relative to body mass (ml/kg/min) was calculated using established formula suitable for use with child samples (Léger, Mercier, Gadoury, & Lambert, 1988).

To determine sedentary screen time, participants were asked to report the number of hours per day they spent watching TV/DVD’s, computer screens, personal digital assistants, tablets or other different devices.

**Adherence to the Mediterranean diet**

Adherence to the MD was assessed using the Evaluation of the Mediterranean Diet Quality Index (KIDMED) (Serra-Majem et al., 2004) which was created to estimate adherence to the MD in children and young adults. The test comprises 16 dichotomous items (yes/no) of which 12 items describe behaviours consistent with the MD, e.g. ‘do you use olive oil at home?’ and four items describe behaviours inconsistent with the MD, e.g. ‘do you consume sweets and candy several times every day?’.

Affirmative answers to MD consistent and inconsistent behaviours were scored +1 and −1, respectively, giving a maximum possible score of 12. Higher scores indicate greater adherence to a MD.

**Statistical analysis**

Means and standard deviations were calculated. Exploratory analysis was conducted to identify differences according to gender and school stage (second-to-last year primary; last year primary; first year secondary; second year secondary). Initial analyses suggested that no differences existed between second-to-last year primary and last year primary participants, or between first year secondary and second year secondary participants. As a result, data were combined to create a dichotomous primary–secondary variable. ANOVA analyses examined differences in BMI, physical activity engagement, VO$_{2\text{max}}$, MD adherence, screen time and HRQoL between genders and school stage. Predictors of the five components of HRQoL for males and females at each school stage were identified using linear regression models. The Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY:IBM Corp.) was used. As analyses were exploratory in nature, $\alpha$ was set at .01.

**Results**

Power analysis suggested that the study required a minimum sample of 378 adolescents to achieve sufficient power with a 95% confidence interval ($\alpha$: .05; $\beta$: .2) to detect differences in the primary HRQoL variables. The present study is therefore reasonably powered.

**Gender differences in primary school**

In primary school, females reported engaging in less physical activity and had a lower VO$_{2\text{max}}$ than males. BMI, screen time and MD adherence did not significantly differ (Table 1). There were no differences according to gender for any of the five components of HRQoL.
Table 1. Gender differences in primary school for measured lifestyle variables (N = 254).

<table>
<thead>
<tr>
<th>Lifestyle variable</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>.01</td>
<td>.94</td>
</tr>
<tr>
<td>Physical activity engagement</td>
<td>10.84</td>
<td>.00*</td>
</tr>
<tr>
<td>VO_{2}\text{max}</td>
<td>100.20</td>
<td>.00*</td>
</tr>
<tr>
<td>Screen time</td>
<td>1.22</td>
<td>.27</td>
</tr>
<tr>
<td>Mediterranean diet adherence</td>
<td>.01</td>
<td>.91</td>
</tr>
<tr>
<td>HRQoL variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical wellbeing</td>
<td>2.75</td>
<td>.10</td>
</tr>
<tr>
<td>Psychological wellbeing</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Family relationships and autonomy support</td>
<td>.08</td>
<td>.78</td>
</tr>
<tr>
<td>Social relationships and peer pressure</td>
<td>.00</td>
<td>.95</td>
</tr>
<tr>
<td>School environment</td>
<td>2.33</td>
<td>.13</td>
</tr>
</tbody>
</table>

*Denotes statistical significance (p < .01).

**Gender differences in secondary school**

In secondary school, females reported engaging in less physical activity and had a lower VO_{2}\text{max} than males. BMI, screen time and MD adherence did not differ significantly. Further, females reported significantly lower scores than males for physical wellbeing and psychological wellbeing (Table 2).

**Differences between primary and secondary school**

For females at secondary school, BMI was higher and physical activity engagement was lower relative to primary school females. For males, the same relationships existed for BMI and physical activity but VO_{2}\text{max} was also higher in secondary school males. Although BMI was higher for both males and females in secondary school, the prevalence of overweight/ obesity was not different (Table 3).

All five components of HRQoL tended to be lower in secondary school adolescents than primary school adolescents. These differences were significant in the case of physical wellbeing, psychological wellbeing and perceptions of the school environment. However, when analyses were conducted according to gender, only perception of the school environment diminished between primary and secondary school in males. For females, physical wellbeing, psychological wellbeing and perception of the school environment all diminished (Table 4).

**Predictors of HRQoL**

For females, BMI and physical activity engagement were the most consistent predictors of HRQoL. In primary school, physical activity positively predicted physical wellbeing ($\beta = .4$, $p < .001$) and psychological wellbeing ($\beta = .27$, $p < .01$). BMI negatively predicted family relationships and autonomy ($\beta = -.25$, $p < .01$) and social relationships and peer pressure ($\beta = -.26$, $p < .01$). For secondary school females, physical activity engagement positively predicted only physical wellbeing ($\beta = .64$, $p < .001$). Screen time was not associated with any aspects of HRQoL, whilst MD adherence predicted more positive perceptions of the school environment ($\beta = .30$, $p < .01$).

For primary school males, physical activity engagement only predicted more positive physical wellbeing ($\beta = .41$, $p < .001$). For secondary school males, engagement in physical activity positively predicted physical wellbeing ($\beta = .29$, $p < .01$) and social relationships and
Table 2. Gender differences in secondary school in lifestyle and psychological variables (N = 205).

<table>
<thead>
<tr>
<th>Lifestyle variable</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>.98</td>
<td>.32</td>
</tr>
<tr>
<td>Physical activity engagement</td>
<td>34.02</td>
<td>.00*</td>
</tr>
<tr>
<td>VO\textsubscript{2max}</td>
<td>145.62</td>
<td>.00*</td>
</tr>
<tr>
<td>Screen time</td>
<td>5.75</td>
<td>.02</td>
</tr>
<tr>
<td>Mediterranean diet adherence</td>
<td>.08</td>
<td>.79</td>
</tr>
<tr>
<td>HRQoL variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical wellbeing</td>
<td>13.11</td>
<td>.00*</td>
</tr>
<tr>
<td>Psychological wellbeing</td>
<td>6.25</td>
<td>.01*</td>
</tr>
<tr>
<td>Family relationships and autonomy support</td>
<td>2.12</td>
<td>.15</td>
</tr>
<tr>
<td>Social relationships and peer support</td>
<td>.61</td>
<td>.43</td>
</tr>
<tr>
<td>School environment</td>
<td>.05</td>
<td>.83</td>
</tr>
</tbody>
</table>

* Denotes statistical significance (p < .01).

Table 3. School stage differences in lifestyle variables for males and females.

<table>
<thead>
<tr>
<th>Lifestyle variable</th>
<th>Females (N=253)</th>
<th>Males (N=203)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>14.95</td>
<td>.00*</td>
</tr>
<tr>
<td>Physical activity engagement</td>
<td>45.41</td>
<td>.00*</td>
</tr>
<tr>
<td>VO\textsubscript{2max}</td>
<td>.21</td>
<td>.65</td>
</tr>
<tr>
<td>Screen time</td>
<td>.73</td>
<td>.40</td>
</tr>
<tr>
<td>Mediterranean diet adherence</td>
<td>.04</td>
<td>.84</td>
</tr>
</tbody>
</table>

* Denotes statistical significance (p < .01).

Table 4. School stage differences in health-related quality of life variables across genders.

<table>
<thead>
<tr>
<th>HRQoL variable</th>
<th>Females (253)</th>
<th>Males (203)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical wellbeing</td>
<td>13.69</td>
<td>.00*</td>
</tr>
<tr>
<td>Psychological wellbeing</td>
<td>11.33</td>
<td>.00*</td>
</tr>
<tr>
<td>Family relationships and autonomy support</td>
<td>6.52</td>
<td>.02</td>
</tr>
<tr>
<td>Social relationships and peer pressure</td>
<td>2.82</td>
<td>.12</td>
</tr>
<tr>
<td>School environment</td>
<td>39.61</td>
<td>.00*</td>
</tr>
</tbody>
</table>

* Denotes statistical significance (p < .01).

peer pressure (\(\beta = .36, p < .01\)). VO\textsubscript{2max} positively predicted perceptions of the school environment (\(\beta = .33, p < .01\)).

**Discussion**

During the final two years of primary school, males and females in this sample of Spanish adolescents did not demonstrate any differences in HRQoL. This is despite females engaging in less physical activity and having lower cardiorespiratory fitness. Breslin and colleagues (Breslin et al., 2012) investigated gender differences in physical activity and HRQoL in a slightly younger sample (9–11-year olds). Similarly, males reported higher levels of physical activity than females. However, unlike the present study, HRQoL was also higher in males than females attending primary school. The present study employed the 27-item version of KIDSCREEN which has been validated within comparable samples (Molina et al., 2014); (The KIDSCREEN Group Europe, 2006), whereas Breslin et al. selected three components from the
52-item measure. Differences in choice of measurement could partly explain some of the differences in findings. However, a study across 12 European countries (Michel, Bisegger, Fuhr, & Abel, 2009) suggested that boys and girls exhibit similar HRQoL around the ages of 8–9, with differences generally emerging in later adolescence. The present Spanish sample therefore demonstrates similar patterns in terms of gender differences in HRQoL to other samples across Europe.

In secondary school, both males and females engage in less physical activity and have a higher BMI. Interestingly, BMI was only related with the wellbeing of primary school female adolescents but not of secondary school female adolescents or for male adolescents at either school stage. Previous research (Ottova, Erhart, Rajmil, Dettenborn-Betz, & Ravens-Sieberer, 2012) has suggested that being overweight is negatively associated with HRQoL for older adolescents. However, that study did not measure physical activity. Breslin et al (Breslin et al., 2012) found weight to have a negligible influence on wellbeing when physical activity was considered. In the present study, physical activity consistently influenced wellbeing suggesting that this may be a more important variable than body weight to target at both school stages for all adolescents. During the first two years of secondary school, females may be more susceptible to poor wellbeing than males. This is corroborated in the present study as females reported significantly lower scores for three components of HRQoL, whereas males only exhibited lower school environment scores. In the present study secondary school males had higher cardiorespiratory fitness than primary school males despite showing similar declines in physical activity to their female counterparts. Markers of fitness relative to body mass tend to remain stable for males between the ages of 6 and 16 but decline in females (Sallis, 1993). It is possible that having higher cardiorespiratory fitness exerts a protective influence over HRQoL in males. Indeed, cardiorespiratory fitness did positively predict physical wellbeing and perceptions of the school environment in male secondary school participants. Interventions increasing physical activity should therefore be encouraged amongst all adolescents and strategies to improve fitness should be particularly examined in males.

A possible concern identified in the present study is that females exhibit significantly less positive perceptions of their physical wellbeing, psychological wellbeing and school environment when they are in secondary school. The transition from primary to secondary school has been highlighted as an area of concern in the development of young adults (Humphrey & Ainscow, 2006). In the present sample, females seem to experience greater diminishments to their HRQoL during this period than males. Changes in physical activity engagement could also be at least partly responsible for some of these differences. Females reduced their engagement in physical activity to a far greater extent than males. Previous research conducted on British 10–11-year olds found friend support was a crucial factor in encouraging females to maintain physical activity levels during the primary-secondary transitional period (Jago, Page, & Cooper, 2012). In a study conducted with Scottish female 13-year olds, participants stated that the more controlling and competence-focused environment of second-ary school contributing to them being less active (Knowles et al., 2011). It is possible that these factors similarly impacted the female sample in the present study. Further research in this area is crucial to identify the causes of these differences and encourage more positive development in Spanish female adolescents.

It is interesting that previous research has identified social relationships to be important factors influencing physical activity in secondary school (Jago et al., 2012; Poorthuis, Thomaes, Van Aken, Denissen, & Orobio De Castro, 2014). In the present study, physical
activity was a consistent predictor of physical and psychological wellbeing, especially for adolescent females. However, physical activity predicted social relationships for primary school female adolescents but not for secondary school female adolescents. Females tend to experience a greater decline in playground-related activity during the transition to secondary school which could diminish their opportunities for making new friends and sharing joint experiences within that context (Chamberlain, George, Golden, Walker, & Benton, 2010). Females are more likely to engage in sedentary activities during rest-breaks (Chamberlain et al., 2010) which has been associated with negative outcomes such as depression (Costigan, Barnett, Plotnikoff, & Lubans, 2013). Interventions such as mobile phone apps which encourage social groups to share active challenges could be explored within similar samples.

In contrast to females, physical activity engagement did predict more positive perceptions of social relationships in secondary school males. In a Belgian study, 10–13-year olds reported their school playground to be more active in secondary school (De Meester et al., 2014). Males are more likely to engage in active games on the playground than their females (Blatchford, Baines, & Pellegrini, 2003). This may explain associations between physical activity and social wellbeing in male adolescents. Physical activity interventions aiming to raise the HRQoL of male adolescents could, therefore, aim to exploit the playground setting.

The final key finding relates to perceptions of the school environment. A study conducted with Swedish adolescents similarly found that 11–12-year olds reported significantly more positive perceptions of their school environment than 15–16-year olds (Svedberg et al., 2013) but their study failed to elucidate reasons for this. In the present study all adolescents, regardless of gender, held less positive perceptions of their school environment in secondary school. This is particularly concerning as negative school experiences are associated with mental health problems throughout adolescence (Waenerlund et al., 2016) and predicts poor academic performance (Vitale, Degoy, & Berra, 2015). It is therefore important to identify strategies to improve experiences of the school environment. For males, higher cardiorespiratory fitness was associated with more positive perceptions of the school environment. This could relate to the previously discussed finding around social wellbeing. It is possible that using the school playground to engage in activity - as is an important aspect of the social wellbeing of males in this sample – could be associated with higher fitness and a more positive view of the school environment. For females, provision of opportunities to enhance social well-being within the school environment should be encouraged to enhance perceptions of the school environment, for example, engagement with healthful or academic behaviours could be rewarded with time on computers or mobile phones.

The present study is cross-sectional in nature and so it cannot make causal inferences about the associations uncovered. Further, whilst the sample size was large and is representative of schools in Granada, further research is required to determine the generalisability of findings across Spain. However, as a first step into examining activity-related, diet-related and weight-related associations with HRQoL of Spanish adolescents at two different school stages, it has important implications for informing future research.

**Implications**

Clinicians and other health professionals should include advice around physical activity routinely as part of advice to young people during any health or growth development consultation but especially when mental health is of concern. Diet should also be discussed and
recommendations based on following a typical Mediterranean diet will be beneficial for many. Parents and professionals working in schools or in other contexts with young people could and should receive basic training to enable them to support greater engagement with physical activity and other healthful behaviours. At a policy level, the present research answers calls to identify interventions capable of preventing and treating mental health disorders. Integrated services which incorporate physical activity and dietary components should be especially promoted during adolescence, as behaviours during this stage will have a strong bearing on behaviour during adulthood.

**Limitations**

The main limitation of the present study is that it was cross-sectional and so cannot identify causality. Further, a degree of measurement error can be expected when using self-report measures. The strengths of the study are its novel consideration of two important lifestyle behaviours within a well-powered sample of young people from a large city in Spain. Further research should examine whether findings can be repeated using other populations and use longitudinal studies to identify cause and effect.

**Conclusion**

Interventions are needed to support the HRQoL of adolescents throughout their adolescence and into adulthood. Physical activity should be considered as an important component of such interventions as it is associated with most aspects of HRQoL. Further, females in both primary and secondary schools need to be targeted as a population at risk of low HRQoL. Further research is needed to examine the mechanisms at work in more detail and in longitudinal research. Exploiting screen-based activities as a means for social connections could be a starting point for further research.

**Acknowledgements**

The authors would like to thank the children, parent and schools who participated in the study.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**ORCID**

Emily C. L. Knox http://orcid.org/0000-0001-8155-9428

**References**


