Eating disorders and unhealthy weight-control behaviours are major issues of public health concern (Hudson et al., 2007; World Health Organization (WHO), 2005). Worldwide prevalence rates of eating disorders are relatively low (1%–5%) (Treasure et al., 2010), but they are associated with severe physical and psychosocial consequences (Herpertz-Dahlmann, 2015). One of the strongest predictors of developing an eating disorder is body image dissatisfaction (Stice, 2002). In a sample of Spanish 12–17 years old, more than 50 per cent of girls and nearly 50 per cent of boys reported dissatisfaction with their body image (Valverde et al., 2010). Importantly, body image dissatisfaction represents a risk factor for the adoption of unhealthy weight-control behaviours that are more common than eating disorders. For instance, it has been shown that adolescents with higher levels of body dissatisfaction (BD)

### Abstract

This cross-sectional study contributes to the literature on whether body dissatisfaction is a barrier/facilitator to engaging in physical activity and to investigate the impact of mass-media messages via computer-time on body dissatisfaction. High-school students (N=1501) reported their physical activity, computer-time (homework/leisure) and body dissatisfaction. Researchers measured students’ weight and height. Analyses revealed that body dissatisfaction was negatively associated with physical activity on both genders, whereas computer-time was associated only with girls’ body dissatisfaction. Specifically, as computer-homework increased, body dissatisfaction decreased; as computer-leisure increased, body dissatisfaction increased. Weight-related interventions should improve body image and physical activity simultaneously, while critical consumption of mass-media interventions should include a computer component.

### Keywords

adolescents, body image, physical activity, sedentary behaviour, social media

---

1Universitat Autonòma de Barcelona, Spain
2IMIM (Hospital del Mar Medical Research Institute), Spain
3Parc Taulí Health Corporation, Spain

**Corresponding author:**
Elizabeth Añez, Research Unit on Eating and Weight-Related Behaviors, Department of Clinical and Health Psychology, Universitat Autonòma de Barcelona, University Campus, Building B, 08193 Bellaterra, Barcelona, Spain.

Email: elizabethvirginia.anez@e-campus.uab.cat
engage more frequently in dieting, unhealthy weight-control behaviours and binge eating (Neumark-Sztainer et al., 2006). The Homeostatic Theory of Obesity and its Circle of Discontent, a system of feedback loops among BD, negative affect, energy consumption and weight gain, offer an interactive framework to study this issue (Diclemente and Delahanty, 2016; Marks, 2015, 2016; Rosenbaum and White, 2016). According to this novel theory, for most people and on most occasions, the reciprocal relationship among these factors is in equilibrium. However, if any of these factors were to increase (i.e. high levels of dissatisfaction, negative affect, energy consumption or body weight), the reciprocity among them forms a vicious circle: a disturbance from equilibrium maintaining problematic eating behaviours and obesity.

During adolescence, many of these problems emerge because teenagers experience important physical and psychological changes, strongly influenced by a society focused on body appearance (Smolak, 2009). Moreover, there are two health-related behaviours that are relevant during this life period. While physical activity (PA) levels decline drastically during adolescence, rates of screen-time exposure increase considerably (Currie et al., 2012; Sallis, 2000). Worldwide estimates indicate that almost 80 per cent of youths do not achieve the public health recommendation of at least 60 minutes per day of moderate-to-vigorous physical activity (MVPA) (Hallal et al., 2012). Specific to Spain, the WHO-Health Behaviour in School-Aged Children (WHO-HBSC) report (Currie et al., 2012) showed that the proportion of adolescents fulfilling the PA recommendation fell from 27 per cent in 11-year-old boys and 15 per cent in girls to 25 per cent in 15-year-old boys and 8 per cent in girls. Furthermore, during adolescence, a rise in exposure time to TV, computers and other types of screens, collectively known as screen-time, has been observed. According to the WHO-HBSC report, the proportion of Spanish adolescents watching TV more than 2 hours daily increased from 60 per cent in 11-year-old boys and 54 per cent in girls to 65 per cent in 15-year-old boys and 63 per cent in girls.

Aside from the well-known health-related physical benefits of regularly engaging in PA such as improved cardiovascular health, reduced risks of diabetes and metabolic syndrome (Hallal et al., 2006; Strong et al., 2005), there are also associated psychological benefits. A recent literature review of works investigating the relationship between exercise and body image concluded that regular exercise has a positive effect on body image (Hausenblas and Fallon, 2006). Interestingly, reversing the direction of the association, it has been argued by Heinberg et al. (2001) that a certain degree of body image dissatisfaction may be beneficial to motivate PA adherence. This last premise should be taken with caution because there are several studies showing that low body satisfaction may be a barrier to engaging in PA (Kopcakova et al., 2014; Neumark-Sztainer et al., 2004; Schuler et al., 2004). For example, it has been reported that people with high social physique anxiety may find wearing sporting clothes or ‘exposing’ their body in front of other people in a gym to be quite intimidating (Crawford and Eklund, 1994; Spink, 1992). Furthermore, it has been reported that among body dissatisfied, at-risk-for-overweight and obesity children and adolescents, peer victimization represented a barrier to engaging in PA (Storch et al., 2007), and among overweight adults, feeling too fat (and having body image concerns) also represented a common barrier to exercise (Ball et al., 2000). From an eating disorders and obesity prevention point of view, it is certainly important to provide further evidence on whether a certain degree of BD might be a barrier or facilitator to engaging in PA. To date, there are no studies looking at this issue in non-Anglo-Saxon large samples. This fact limits the generalizability of previous findings in other cultures. Thus, the first aim of this study is to investigate whether BD represents a barrier to engaging in PA in a large sample of adolescents from Catalonia, Spain.

As previously noted, during adolescence, screen-time exposure increases, and this is of
concern as it has been identified as an important risk factor for physical and psychological poor health. For example, it has been linked to weight gain/obesity risk in adulthood, reduced self worth, reduced academic achievement, depression and as a potential risk factor for eating disorders (Jordan et al., 2008; Thorp et al., 2011; Tremblay et al., 2011; Vaughan and Fouts, 2003). According to sociocultural models of eating disorders, mass-media messages pressure individuals to conform to the cultural ideals of beauty (Levine and Murmen, 2009; López-Guimerà et al., 2010). Internalization of these ideals results in BD because attaining these ideals is generally very difficult for most people (Thompson and Stice, 2001). Then, BD could lead to negative affect and disordered eating, which can lead to eating disorders. Cross-sectional studies have found positive associations among media use (TV and magazines), and BD and disordered eating behaviour among adolescents (López-Guimerà et al., 2010; Vaughan and Fouts, 2003). Likewise, experimental studies have shown that exposure to thin-ideal images causes an increase in BD (Levine and Murmen, 2009; López-Guimerà et al., 2010). However, the majority of these studies have focused on the impact of TV and magazines, and despite a growing interest during the past years on investigating the impact of being exposed to the Internet (mainly social networks, such as Facebook), little is known about the broader role of computers on BD (Bair et al., 2012; Fardouly et al., 2015; Fardouly and Vartanian, 2015; Mabe et al., 2014; Meier and Grey, 2014; Tiggemann and Miller, 2010; Tiggemann and Slater, 2013a, 2013b; Williams and Ricciardelli, 2014). According to the 2011 Survey on Information and Communication Technology, more than half of the individuals in the European Union use Internet everyday or almost every day (Seybert and States, 2012). In 2014, in Spain, nearly 75 per cent of households reported having Internet access and at least one computer (Instituto Nacional de Estadisticas, 2014). Interestingly, in a recent study of adolescents from several countries of the European Union, Spanish adolescents between 14 and 17 years are the group with the highest percentage of daily use of social networks in Europe (91.6%) and 39.2 per cent recognized spending more than 2 hours in these websites daily (Tsitsika et al., 2013). The growth in recent years in accessibility to this technology highlights the importance of researching the relationship between computer-use and BD. Thus, the second aim of this study is to add to the existing literature on the impact of TV and magazines on BD, by investigating the association of computer-time exposure and BD.

Method

Participants

Data for this study were drawn from baseline assessments of the MABIC project, a study on the prevention of eating and weight-related problems conducted in the Barcelona area, Spain (Sánchez-Carracedo et al., 2016). The study sample was compromised by 1501 adolescents attending 11 secondary schools. Mean participant age was 14.2 (standard deviation (SD) = 1.1; range = 13–17) years, and participants were roughly equally distributed across genders (47.6% girls) and grades. The self-reported racial/ethnic background of participants was as follows: 71.7 per cent Spanish, 12.8 per cent Latin-American, 2.2 per cent from other European countries, 5.6 per cent African and 8.0 per cent of mixed or unknown origin. Socioeconomic status (SES), according to parents’ educational level and occupational status (Hollingshead, 1975), was predominantly middle-class (medium low = 38.5%, medium = 26.5% and medium high = 16.3%). The study was approved by the Animal & Human Experimentation Ethics Committee of the Universitat Autònoma de Barcelona. Parents were informed about the study via the school administration and could opt out if they disagreed with participation of their child. Participation rate was high (85.5%), while main reasons for lack of participation were as follows: absenteeism at the assessment day.
(10.1%), no parental consent (3.6%) and unwillingness to participate/medical conditions (0.8%).

**Measures and procedures**

Participants completed a paper and pencil booklet with a battery of validated questionnaires that included measures on body image, PA, screen-time exposure, and demographic and sociocultural identified in the literature to affect PA, BD and screen-time. Factors that have been shown to predict declines in PA are being female, increasing age during adolescence, being of low SES and from non-Caucasian ethnicity (Bauman et al., 2012). Factors associated with higher BD are being female, having a higher body mass index (BMI), having a high internalization of the beauty ideal and being susceptible to sociocultural pressures (Smolak, 2009; Thompson and Stice, 2001; Williams and Ricciardelli, 2014). Factors that have been found to correlate with increased levels of screen-time exposure in adolescence are less conclusive, but gender, SES and BMI are generally controlled for in the literature (Dumith et al., 2012; Van der Horst et al., 2007).

The booklet was completed individually during regular class time, while height and weight were taken in a private room near the area of booklet administration. Completion of the questionnaires coupled with anthropometric assessments lasted approximately 60 minutes. Assessments took place between January and March 2011.

**Body image dissatisfaction.** It was assessed with the BD subscale of the Eating Disorders Inventory-3 (EDI-3) (Garner, 2004), in its Spanish validated version (Elosua et al., 2010). This is a 10-item scale that measures satisfaction with different parts of the body with response options on a six-point Likert scale from ‘0 = Never’ to ‘5 = Always’. Higher scores on the scale indicate greater dissatisfaction with one’s body. The EDI-3 is well validated in female populations, and its validity in male populations has also been reported in a sample of adolescent boys (Spillane et al., 2004). In this study, the internal consistency of the EDI-BD subscale was found to be acceptable for both genders (Cronbach’s alpha = 0.85 for girls and 0.81 for boys).

**MVPA.** It was assessed with two items that asked participants to report the number of hours on a typical week (7 days) that they spent on vigorous physical activities (‘heart beats rapidly’) and moderate physical activities (‘not exhausting’) separately. Each type of activity was exemplified with a list of activities to aid comprehension. Examples of vigorous physical activities were intense cycling, running, swimming, aerobic dancing, skating, football and basketball; examples of moderate physical activities were fast walking, light cycling, weight lifting, dancing and volleyball. These items were taken from the EAT Project Inventory (Neumark-Sztainer et al., 2012). Responses were on a nine-point scale ranging from ‘0 hours to 7 or more hours’. For the analyses, first, we re-coded responses to correspond to number of hours; the response ‘7 hours or more’ was coded simply as 7 hours, and then created a score by adding up responses to the moderate and vigorous scores to form a total time score spent in MVPA (score range = 0–14). This score was created in line with the public health recommendation for adolescents that suggests attaining at least 60 minutes per day of MVPA (Hallal et al., 2012).

**Screen-time exposure.** It was assessed with six questions from the EAT Project Inventory (Neumark-Sztainer et al., 2012) that asked participants to report the number of hours on a typical school-day (Monday–Friday) that they watch TV, use a computer for doing homework (computer-homework) and use a computer for leisure (computer-leisure). Participants were also asked to report the number of hours spent on these three activities (i.e. TV, computer-homework and computer-leisure) on a typical day of the weekend (Saturday–Sunday). Response options were on a seven-point scale ranging from ‘0, 0.5, 1, 2, 3, 4’ to ‘5 hours or more’. To facilitate interpretation of results, for the analyses, we re-coded responses to
correspond to hours. The response ‘5 hours or more’ was coded simply as 5 hours (Neumark-Sztainer et al., 2004).

**Sociocultural pressures and internalization of the beauty ideal.** They were assessed with the Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3) (Thompson et al., 2004), in its Spanish validated version (Sánchez-Carracedo et al., 2012). It consists of four subscales: (1) ‘Internalization-General’ to evaluate the internalization of the general beauty ideal transmitted by TV and magazines, (2) ‘Internalization-Athlete’ that assesses the internalization of athletic models, (3) ‘Information’ which assesses the belief that the mass media is an important source of information about appearance and (4) ‘Pressures’ which assesses feelings of pressure from media messages to modify one’s appearance. Participants respond on a five-point Likert scale from ‘completely disagree’ to ‘completely agree’. In this study, the reliability estimates for the four subscales were 0.93, 0.83, 0.91 and 0.93, respectively.

**BMI.** Researchers measured participant’s body weight in light clothing and no shoes to the nearest 0.1 kg using digital scales (SECA-model 872) and height to the nearest 0.1 cm with a wall-mounted stadiometer (SECA-model 214). Weight values were later corrected by subtracting 0.9 kg from the boys and 0.7 kg from the girls, which are average values estimated after weighing several sets of clothes similar to those worn at the time of assessment. BMI z-scores were calculated using WHO 2007 growth reference criteria (De Onis et al., 2007).

**Statistical analyses**

Statistical analyses were performed with STATA13 (StataCorp LP, 2013), and the level of significance was set at 0.05. There are well-established gender differences in body satisfaction and PA (both higher in boys than in girls, especially in adolescents) (Grunbaum et al., 2002; Neumark-Sztainer et al., 2002); hence, to facilitate interpretation of results, all analyses were conducted separately for boys and girls. Independent t-tests were performed to compare main variables included in the analyses across gender groups. To assess the association between BD and PA on one hand, and screen-time variables and BD on the other hand, linear mixed effects (LME) regression models with random intercepts were used. The LME model was used since adolescents within the same schools are likely to display similar correlated values in several variables, so that school was used as a cluster variable in the model. In the first model, BD was treated as the independent variable and MVPA as the dependent variable; in the second model, BD was treated as the dependent variable and all six screen-time variables as independent variables. Both LME regression models were adjusted, with sociodemographic variables (ethnicity, age, BMI Z-scores and SES) and sociocultural variables (SATAQ-3 variables).

**Results**

Table 1 summarizes the descriptive statistics and results of independent t-tests to compare main variables included in the regression models between gender groups. Noteworthy, only 1.9 per cent of adolescents met the screen-time recommendation (a maximum of 2 hours of total screen-time daily) and only 22.1 per cent reached the PA guidelines. For informative purposes, in the Supplementary Files section (available at: http://hpq.sagepub.com/), we provide a table of correlations between BD and the six screen-time-related variables and MVPA by gender group.

**BD and PA**

LME regression model examining the associations between BD and MVPA after adjusting for control variables was significant for girls (total explained variance = 9.49%, Wald $\chi^2$ (9) = 56.307, $p<0.001$) and boys (total explained variance = 11.10%, Wald $\chi^2$ (9) = 60.69, $p<0.001$). School was not a significant factor affecting the relation between BD and MVPA on any gender group.
In particular, BD was significantly associated with lower rates of MVPA in girls: \( B = -0.04, \) standard error (SE) = 0.02, \( p = 0.011, \) 95 per cent confidence interval (CI) = (−0.08, −0.02) and boys: \( B = -0.07, \) SE = 0.02, \( p < 0.001, \) 95 per cent CI = (−0.10, −0.03).

### Screen-time and BD

Table 2 illustrates the LME regression model results of the association between the screen-time variables and BD after adjusting for control variables. School was a significant factor for the model ran for boys \( (p = 0.009), \) but not for girls \( (p = 0.889). \) The models were statistically significant in both gender groups (girls: \( B = -0.04, \) standard error (SE) = 0.02, \( p = 0.011, \) 95 per cent confidence interval (CI) = (−0.08, −0.01) and boys: \( B = -0.07, \) SE = 0.02, \( p < 0.001, \) 95 per cent CI = (−0.10, −0.03). Specifically, BD decreased as the number of computer-homework hours increased \( (B = -0.70, \) \( p < 0.001), \) and BD increased as the number of computer-leisure hours increased \( (B = 0.56, \) \( p = 0.01). \) There were no statistically significant associations between BD and TV hours in any gender group.

### Discussion

In line with global trends, our findings in a large sample of Spanish adolescents showed that a large proportion of adolescents are generally inactive (77.9%), have a screen-time exposure way above the recommended levels (98.9%) and express some degree of dissatisfaction with their body image (65.9%). All these variables are of concern and put them at higher risk of developing physical and psychological distress. Particularly, this study explored first, whether a certain degree of BD was negatively associated
to regularly engaging in PA and second, whether screen-time exposure was associated to BD.

There is a wealth of evidence showing that regular engagement in PA is beneficial for improving body satisfaction (Hausenblas and Fallon, 2006). However, evidence on whether high levels of BD may be a barrier to engaging in MVPA or not is mixed. It has been proposed that certain degree of BD may motivate individuals to engage in PA (Heinberg et al., 2001). On the other hand, past research has found that social physique anxiety, weight-related peer victimization, feelings of being ‘too fat’ and high levels of BD can represent a barrier to PA engagement, both in girls and boys (Ball et al., 2000; Crawford and Eklund, 1994; Focht and Hausenblas, 2004; Kopcakova et al., 2014; Neumark-Sztainer et al., 2004, 2006; Schuler et al., 2004; Spink, 1992; Storch et al., 2007). Our data seem to support this last premise, although the cross-sectional nature of our study does not allow us to establish the exact direction of the relationship between BD and PA. Nonetheless, this finding is important for future interventions in eating and weight-related problems, which should aim to improve body image and PA levels together, and do not rely on the fact that BD will motivate people to increase PA.

In the last few years, there has been a burgeoning interest in study in the relation between computer-use and body image. The majority of them focus on the use of the Internet, more specifically on social network sites (e.g. Facebook), computer-based publicity and the impact of pro-anorexia-web pages (Bair et al., 2012; Fardouly et al., 2015; Fardouly and Vartanian, 2015; Holland and Tiggemann, 2016; Mabe et al., 2014; Meier and Grey, 2014; Tiggemann and Miller, 2010; Tiggemann and Slater, 2013a, 2013b). Importantly, the vast majority of these studies investigated the relationship in girls only. To our knowledge, this study is one of the few evaluating the impact of computer-time on adolescent girls’ and boys’ BD. First, we found a significant association for girls but not for boys. In particular, we found that a greater number of hours of computer-use for leisure were associated with higher scores of BD, but that greater number of hours of computer-use for doing homework was associated with lower scores of BD. Without information about the content of the material viewed, it is difficult to interpret the findings, and so the differences between boys and girls. However, there is evidence that the influence of media on BD seems to be higher for girls than for boys (Calado

### Table 2. LME regression model of the association between body dissatisfaction and screen-time variables by gender group.

| Variables | Females | | | | Males | | | |
|-----------|---------|---|---|---|---------|---|---|---|
|           | B   | SE | p   | 95% CI | B   | SE | p   | 95% CI |
| WDTV      | −0.04 | 0.25 | 0.886 | (−0.53, 0.46) | −0.07 | 0.21 | 0.748 | (−0.50, 0.36) |
| WDC-H     | −0.69 | 0.26 | **0.009** | (−1.21, −0.18) | −0.06 | 0.23 | 0.781 | (−0.52, 0.39) |
| WDC-L     | −0.04 | 0.22 | 0.872 | (−0.49, 0.41) | −0.16 | 0.2 | 0.431 | (−0.56, 0.24) |
| WETV      | 0.11 | 0.24 | 0.658 | (−0.36, 0.57) | −0.18 | 0.21 | 0.385 | (−0.60, 0.23) |
| WEC-H     | 0.34 | 0.26 | 0.196 | (−0.18, 0.86) | 0.09 | 0.24 | 0.705 | (−0.39, 0.57) |
| WEC-L     | 0.57 | 0.23 | **0.013** | (0.12, 1.02) | 0.05 | 0.19 | 0.78 | (−0.33, 0.44) |

Random effect

| School | 3.06e−11 | 2.13e−10 | 0.889 | (3.53e−17; 2.65e−5) | 0.91 | 0.35 | **0.009** | (0.43, 1.92) |

LME: linear mixed effects; SE: standard error; WDTV: weekday TV; WDC-H: weekday computer-homework; WDC-L: weekday computer-leisure; WETV: weekend TV; WEC-H: weekend computer-homework; WEC-L: weekend computer-leisure.

Model adjusted for Age, Ethnicity, SES, BMI Z-score, Internalization-General, Internalization-Athlete, Pressures and Information.

Significant p-values in bold.
et al., 2011; Swami et al., 2010). Internalization of the thin-beauty ideal (extensively promoted by Western media) is thought to directly promote BD because it is unattainable for most women (Homan, 2010). Hence, we may hypothesize that when girls use computers for surfing the Internet or social networking in their leisure time, they are exposed to messages around the beauty ideal, which in consequence negatively affect their body image. This finding is in line with the predictions of sociocultural models and previous studies that have demonstrated the mediating role of internalization of the thin-beauty ideal, in the relation between BD and the use of Internet-based social network sites such as Facebook (Tiggemann and Miller, 2010; Tiggemann and Slater, 2013a, 2013b).

An original aspect of this study is that it not only focused on computer-time during adolescents’ leisure time but also explored the relationship between computer-time for doing homework and body image. Specifically, we found that girls who spend more hours with computers doing homework have a more positive body image, possibly, because they are not being exposed to beauty ideal messages. In addition, they may derive a positive self-evaluation from attributes of their personality other than their physical appearance (e.g. cognitive abilities and school achievement) (Booth and Gerard, 2013; Marsh et al., 2005). For example, in a correlational study, undergraduate girls with higher academic achievement reported lower concern with their physical appearance (Miles, 2009). Certainly, this is an issue worth investigating in the future. More research is granted to investigate why this connection may exist.

Several studies have shown the negative impact that TV exposure has on body image (Levine and Murnen, 2009; López-Guimerà et al., 2010). In our study, the number of raw hours exposed to TV was not statistically significantly associated to BD. Our measure was quite crude and did not ask about the type of programmes or content. This global measure may not be sufficient to capture the well-documented impact of TV on BD. Another possible explanation may be related to a change in screen ‘types’ usage. When we compare in our sample the number of hours that adolescents spend watching TV or using computers for leisure activities, the latter is higher. This is consistent with trends in developed countries. In 2015, US adolescents between 12 and 17 years were the age group with the least weekly TV hours, and noteworthy, in the space of 4 years, almost one-third of this age group’s traditional TV viewing time has migrated to other activities (Marketing Charts, 2015). In Catalonia, trends are similar with people between 15 and 29 years old, being the age group with the lowest percentage of average TV time (after the 65+ age group) (Institut d’Estadistica de Catalunya, 2006). It seems that in the past, TV has been a big source of information, but with the advent of Internet and new technologies, the focus has shifted to other type of media (i.e. computers, tablets, smartphones, Facebook, Instagram and Tweet). This is a valuable finding for future interventions oriented to the critical consumption of mass media pointing to the necessity of including these new media component in addition to TV and magazines.

We acknowledge a number of limitations. Self-reported measures were used to report PA and screen-time. Objective measures such as the use of accelerometers would have been preferable. However, the use of these tools was not feasible in a sample of this scale. Notwithstanding, all the measures used have been previously validated. In addition, there are biological factors, especially relevant during adolescence such as biological maturity, which may influence PA adherence (Machado Rodrigues et al., 2010). Particularly to adolescent girls, there is evidence of a negative association between levels of PA and biological maturity, being mediated by self-concept (Cumming et al., 2011). In future studies, investigating the impact of BD on PA engagement may be worth including a measure of biological maturity, to shed further light on this relationship. Another limitation is that at the time of doing data collection, the use of tablets and
smartphones was not as widespread as it is today in Spain. It is possible that if we had included some questions about these types of technologies, we would have found stronger effects on body image. The most important limitation is that because of the cross-sectional design of this study, we are unable to establish causal relationships among PA, computer-time and BD.

This study has also a number of important strengths. The large and diverse sample in terms of ethnicity and SES increases the generalizability of the findings. Importantly, we contributed to the literature in the field within a Spanish sample. This is of great value because the majority of studies examining this theme have been conducted in Anglo-Saxon cultures, mainly United States. Even though Spain shares a number of characteristics of Western culture such as the general ideal of beauty and unhealthy messages of weight-control strategies, Spain, along with other European countries, has its own cultural traditions and eating patterns, which may be protective from developing disordered eating behaviours. For example, Spain involves the Mediterranean diet, seen as one of the healthiest; in the Spanish society, family meals are still common; and although in recent years there has been an increase in the number of fast food restaurants, they still are poorly frequented compared to the more traditional establishments, where the cuisine is similar to the Mediterranean diet (Davidson and Gauthier, 2010; López-Guimerà et al., 2013; Marin-Guerrero et al., 2008). Moreover, the instruments used to measure key variables were all validated measures within Spanish samples and the objective assessment of height and weight reduced any self-report bias. Noteworthy, we investigated the role of computer-use on BD, an area which certainly in the near future will grow considerably. Future research may explore the quality of programmes/messages that are transmitted in TV versus computers, tablets and smartphones, as well as the impact of new technologies on BD and PA. Future studies on body image may explore the impact of specific uses of new technologies (i.e. mainly for email; mainly social networking; mainly for work; computer gaming, downloading movies and music videos).

**Conclusion**

This study showed within a large sample of Spanish adolescents that BD can work as a barrier and not a motivator to PA adherence. Importantly, it was found that the use of computers during leisure time was negatively associated with girls’ body image. Findings of this study along with previous research findings have implications for the development of programmes aimed at preventing the broad spectrum of weight-related disorders with a focus on improving body satisfaction and PA simultaneously, as well as the critical consumption of messages delivered via new technologies.

**Acknowledgements**

The authors would like to thank all participating schools and students for their help in the study.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded with a grant from the Ministry of Science & Innovation of the Spanish Government (Ref: PSI2009-08956).

**References**

Bair CE, Kelly NR, Serdar KL, et al. (2012) Does the internet function like magazines? An exploration of image-focused media, eating pathology, and body dissatisfaction. *Eating Behaviors* 13(4): 398–401.

Ball K, Crawford D and Owen N (2000) Too fat to exercise? Obesity as a barrier to physical activity. *Australian and New Zealand Journal of Public Health* 24(3): 331–333.

Bauman A, Reis R, Sallis J, et al. (2012) Correlates of physical activity: Why are some people physically active and others not? *The Lancet* 380: 258–271.
Booth M and Gerard J (2013) Self-esteem and academic achievement: A comparative study of adolescent students in England and the United States. Compare 41(5): 629–648.

Calado M, Lameiras M, Sepulveda AR, et al. (2011) The association between exposure to mass media and body dissatisfaction among Spanish adolescents. Women’s Health Issues 21(5): 390–399.

Crawford S and Eklund R (1994) Social physique anxiety, reasons for exercise and attitudes towards exercise. Journal of Sport and Exercise Psychology 16(1): 70–82.

Cumming SP, Standage M, Loney T, et al. (2011) The mediating role of physical self-concept on relations between biological maturity status and physical activity in adolescent females. Journal of Adolescence 34(3): 465–473.

Currie C, Zanotti C, Morgan A, et al. (2012) Social determinants of health and well-being among young people. Health Behaviour in School-aged Children (HBSC) study: International report from the 2009/2010 survey. Available at: http://www.euro.who.int/en/health-topics/Life-stages/child-and-adolescent-health/publications/2012/social-determinants-of-health-and-well-being-among-young-people.-health-behaviour-in-school-aged-children-hbsc-study

Davidson R and Gauthier AH (2010) A cross-national multi-level study of family meals. International Journal of Comparative Sociology 51(5): 349–365.

De Onis M, Onyango AW, Borghi E, et al. (2007) Development of a WHO growth reference for school-aged children (HBSC) study: International report from the 2009/2010 survey. Available at: http://www.euro.who.int/en/health-topics/Life-stages/child-and-adolescent-health/publications/2012/social-determinants-of-health-and-well-being-among-young-people.-health-behaviour-in-school-aged-children-hbsc-study

Diclemente CC and Delahanty J (2016) Homeostasis and change: A commentary on homeostatic theory of obesity by David Marks. Health Psychology Open 3(1): 10–12.

Dumith SC, Martin L, da Silva KS, et al. (2012) Predictors and health consequences of screen-time change during adolescence –1993 Pelotas (Brazil) birth cohort study. Journal of Adolescent Health 51(6): S16–S21.

Elosua P, López-Jáuregui A and Sánchez-Sánchez F (2010) EDI-3. Inventario de Trastornos de la Conducta Alimentaria-3. manual. Madrid: Tea Ediciones.

Fardouly J and Vartanian LR (2015) Negative comparisons about one’s appearance mediate the relationship between Facebook usage and body image concerns. Body Image 12: 82–88.

Fardouly J, Diedrichs PC, Vartanian LR, et al. (2015) Social comparisons on social media: The impact of Facebook on young women’s body image concerns and mood. Body Image 13: 38–45.

Focht BC and Hausenblas HA (2004) Perceived evaluative threat and state anxiety during exercise in women with social physique anxiety. Journal of Applied Sport Psychology 16(4): 361–368.

Garner DM (2004) EDI 3 (Eating Disorder Inventory-3): Professional Manual. Odessa, FL: Psychological Assessment Resources, Inc.

Grunbaum JA, Kann L, Kinchen SA, et al. (2002) Youth risk behavior surveillance – United States, 2001. MMWR Surveill Summ 51: 1–62.

Hallal PC, Andersen LB, Bull FC, et al. (2012) Physical activity levels of the world’s population: Surveillance progress, gaps and prospects. The Lancet 380: 247–257.

Hallal PC, Victora CG, Azevedo MR, et al. (2006) Adolescent physical activity and health. Sports Medicine 36: 1019–1030.

Hausenblas HA and Fallon EA (2006) Exercise and body image: A meta-analysis. Psychology & Health 21: 33–47

Heinberg L, Thompson J and Matzon J (2001) Body image dissatisfaction as a motivator for healthy lifestyle change: Is some distress beneficial? In: Striegel-Moore RH and Smolak L (eds) Eating disorders: Innovative directions in research and practice. Washington, DC: American Psychological Association, pp. 215–232.

Herpertz-Dahlmann B (2015) Adolescent eating disorders: Update on definitions, sympto-matology, epidemiology, and comorbidity. Child and Adolescent Psychiatric Clinics of North America 24(1): 177–196.

Holland G and Tiggemann M (2016) Review article a systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. Body Image 17: 100–110.

Hollingshead A (1975) Four factor index of social status [1975]. Available at: http://ubir.buffalo.edu/xmlui/handle/10477/1879

Homan K (2010) Athleti-ideal and thin-ideal internalization as prospective predictors of body dissatisfaction, dieting, and compulsive exercise. Body Image 7(3): 240–245.

Hudson J, Hiripi E, Pope HJ, et al. (2007) The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. Biological Psychiatry 61(3): 348–358.
Institut d’Estadística de Catalunya (2006) Audiencia Habitual de televisió. Available at: http://www.idescat.cat/pub/?id=eac&n=3.3.2.03&lang=es (accessed 8 August 2016).

Instituto Nacional de Estadisticas (2014) Encuesta sobre Equipamiento y Uso de Tecnologías de Información y Comunicación en los Hogares. Año 2014. Available at: http://www.ine.es/prensa/wp864.pdf

Jordan AB, Kramer-Golinkoff EK and Strasburger VC (2008) Does adolescent media use cause obesity and eating disorders. Adolescent Medicine: State of the Art Reviews 19: 431–449.

Kopcakova J, Veselska Z, Geckova A, et al. (2014) Is being a boy and feeling fat a barrier for physical activity? The association between body image, gender and physical activity among adolescents. International Journal of Environmental Research and Public Health 11(11): 11167–11176.

Levine MP and Murmen SK (2009) ‘Everybody knows that mass media are/are not [pick one] a cause of eating disorders’: A critical review of evidence for a causal link between media, negative body image, and disordered eating in females. Journal of Social and Clinical Psychology 28(1): 9–42.

López-Guimerà G, Levine MP, Sánchez-Carracedo D, et al. (2010) Influence of mass media on body image and eating disordered attitudes and behaviors in females: A review of effects and processes. Media Psychology 13(4): 387–416.

Mache AG, Forney KJ and Keel PK (2014) Do you ‘like’ my photo? Facebook use maintains eating disorder risk. International Journal of Eating Disorders 47(5): 516–523.

Machado Rodrigues M, Cohelo e Silva M, Cumming S, et al. (2010) Confounding effect of biologic maturation on sex differences in physical activity and sedentary behavior in adolescents. Pediatric Exercise Science 22(3): 442–453.

Marin-Guerrero AC, Gutierrez-Fisac j L, Guillar-Castillón P, et al. (2008) Eating behaviours and obesity in the adult population of Spain. British Journal of Nutrition 100: 1142–1148.

Marketing Charts (2015) Are young people watching less TV? (Updated – Q1 2015 Data). 30 June 2015. Available from: http://www.marketingcharts.com/television/are-young-people-watching-less-tv-24817/ (accessed 7 July 2015).

Marks DF (2015) Homeostatic theory of obesity. Health Psychology Open 2(1): 1–30.

Marks DF (2016) Dyshomeostasis, obesity, addiction and chronic stress. Health Psychology Open 3(1): 1–20.

Marsh HW, Trautwein U and Lu O (2005) Academic self-concept, interest, grades, and standardized test scores: Reciprocal effects models of causal ordering. Child Development 76(2): 397–416.

Meier E and Grey J (2014) Facebook photo activity associated with body image disturbance in adolescent girls. Cyberpsychology, Behavior, and Social Networking 17(4): 199–206.

Miles J (2009) Academic achievement and body image in undergraduate women. Available at: http://eric.ed.gov/?id=ED503960

Neumark-Sztainer D, Goeden C, Story M, et al. (2004) Associations between body satisfaction and physical activity in adolescents: Implications for programs aimed at preventing a broad spectrum of weight-related disorders. Eating Disorders 12(2): 125–137.

Neumark-Sztainer D, Paxton SJ, Hannan PJ, et al. (2006) Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. Journal of Adolescent Health 39(2): 244–251.

Neumark-Sztainer D, Story M, Hannan PJ, et al. (2002) Weight-related concerns and behaviors among overweight and nonoverweight adolescents: Implications for preventing weight-related disorders. Archives of Pediatrics & Adolescent Medicine 156: 171–178.

Neumark-Sztainer D, Wall MM, Larson N, et al. (2012) Secular trends in weight status and weight-related attitudes and behaviors in adolescents from 1999 to 2010. Preventive Medicine 54: 77–81.

Rosenbaum DL and White KS (2016) Understanding the complexity of biopsychosocial factors in the public health epidemic of overweight and obesity. Health Psychology Open 3(1): 1–4.

Sallis JF (2000) Age-related decline in physical activity: A synthesis of human and animal studies. Medicine and Science in Sports and Exercise 32(9): 1598–1600.

Sánchez-Carracedo D, Barrada JR, López-Guimerà G, et al. (2012) Analysis of the factor structure of the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-3) in...
Spanish secondary-school students through exploratory structural equation modeling. *Body Image* 9: 163–171.

Sánchez-Carracedo D, Fauquet J, Gemma L, et al. (2016) The MABIC project. An effectiveness trial for reducing risk factors for eating disorders. *Behaviour Research and Therapy* 77: 23–33.

Schuler P, Broxon-Hutcherson A, Philipp S, et al. (2004) Body-shape perceptions in older adults and motivations for exercise. *Perceptual and Motor Skills* 98(2): 1251–1260.

Seybert H and States M (2012) EU survey on ICT usage in households and by individuals, Luxembourg. Available at: http://www.ecdl.gr/el/presscenter/press/news/Documents/Digital_Agenda_survey.pdf

Smolak L (2009) Risk factors in the development of body image, eating problems, and obesity. In: Smolak L and Thompson JK (eds) *Body Image, Eating Disorders, and Obesity in Youth: Assessment, Prevention, and Treatment* (2nd edn). Washington, DC: American Psychological Association, pp. 135–155.

Spillane NS, Boerner LM, Anderson KG, et al. (2004) Comparability of the eating disorder Inventory-2 between women and men. *Assessment* 11: 85–93.

Spink KS (1992) Relation of anxiety about social physique to location of participation in physical activity. *Perceptual and Motor Skills* 74: 1075–1078.

StataCorp LP (2013) *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP.

Stice E (2002) Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin* 128: 825–848.

Storch EA, Milsom VA, Debraganza N, et al. (2007) Peer victimization, psychosocial adjustment, and physical activity in overweight and at-risk-for-overweight youth. *Journal of Pediatric Psychology* 32(1): 80–89.

Strong W, Malina R, Blimkie CJ, et al. (2005) Evidence based physical activity for school-age youth. *Journal of Pediatrics* 146(6): 732–737.

Swami V, Frederick DA, Aavik T, et al. (2010) The attractive female body weight and female body dissatisfaction in 26 countries across 10 world regions: Results of the International Body Project I. *Personality and Social Psychology Bulletin* 36: 309–325.

Thompson JK and Stice E (2001) Thin-ideal internalization: Mounting evidence for a new risk factor for body-image disturbance and eating pathology. *Current Directions in Psychological Science* 10(5): 181–183.

Thompson JK, Van Den Berg P, Roehrig M, et al. (2004) The Sociocultural Attitudes Towards Appearance Scale-3 (SATAQ-3): Development and validation. *International Journal of Eating Disorders* 35: 293–304.

Thorpe AA, Owen N, Neuhaus M, et al. (2011) Sedentary behaviors and subsequent health outcomes in adults. *American Journal of Preventive Medicine* 41(2): 207–215.

Tiggemann M and Miller J (2010) The internet and adolescent girls’ weight satisfaction and drive for thinness. *Sex Roles* 63: 79–90.

Tiggemann M and Slater A (2013a) NetGirls: The internet, Facebook, and body image concern in adolescent girls. *International Journal of Eating Disorders* 46(6): 630–633.

Tiggemann M and Slater A (2013b) NetTweens: The internet and body image concerns in preteenage girls. *The Journal of Early Adolescence* 34(5): 606–620.

Treasure J, Claudino AM and Zucker N (2010) Eating disorders. *The Lancet* 375(9714): 583–593.

Tremblay M, LeBlanc A, Kho M, et al. (2011) Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity* 8(1): 98.

Tsitsika A, Tzavela E, Mavromati F, et al. (2013) Investigacion sobre conductas adictivas a Internet entre los adolescents Europeos. Available at: http://www.injuve.es/sites/default/files/2013/03/publicaciones/FinalResearchInternet-ES.pdf

Valverde PR, De los Santos FR and Rodriguez CM (2010) Sex differences in body image, weight control and Body Mass Index of Spanish adolescents. *Psicothema* 22(1): 77–83.

Van der Horst K, Paw M, Twisk J, et al. (2007) A brief review on correlates of physical activity and sedentariness in youth. *Medicine and Science in Sports and Exercise* 39(8): 1241–1250.

Vaughan K and Fouts G (2003) Changes in television and magazine exposure and eating disorder symptomatology. *Sex Roles* 49: 313–320.

Williams RJ and Ricciardelli LA (2014) Social media and body image concerns: Further considerations and broader perspectives. *Sex Roles* 71(11–12): 389–392.

World Health Organization (WHO) (2005) *Mental Health of Children and Adolescents: Facing the Challenges and Finding Solutions*. Geneva: WHO.