South African Journal for Research in Sport, Physical Education and Recreation, 2016, 38(2): 139 - 152.
Suid-Afrikaanse Tydskrif vir Navorsing in Sport, Liggaamlike Opvoedkunde en Ontspanning, 2016, 38(2): 139 - 152.
ISBN: 0379-9069

REPRESENTATION OF PHYSICAL ACTIVITY DOMAINS AND SEDENTARY BEHAVIOURS IN PHYSICAL EDUCATION TEXTBOOKS: AN IMAGE ANALYSIS

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ABSTRACT

Schools play an important role in promoting active lifestyles among children. The aim of this study was to evaluate the representation of physical activity (PA) and sedentary behaviours (SBs) in the images of physical education (PE) textbooks. The initial sample was composed of 1 094 images from Spanish PE textbooks. A final sample of 291 images was randomly selected. They were analysed using a coding scheme. The PA domains and SBs, the gender and age of the characters, the time at which the activity occurred and the presence of disability were considered. Men were mainly predominant in the images, which showed leisure-time physical activities (LTPAs). A high percentage of images showed both genders performing SBs. Both the images representing LTPAs and SBs took place mainly after school. Images illustrating active commuting situations were negligible. Both disabled and the elderly groups were under represented. These findings highlight the need to reduce the normalisation of SBs in PE textbooks whilst also minimising differences in gender, age and disability categories in distinct PA contexts. Teachers should be made aware of the imbalance of images according to these categories in order to select textbooks that depict under-represented persons engaged in PA in multiple settings.

Key words: Curriculum; Health policy; Methods and materials of instruction; Public Health; School.

INTRODUCTION

Insufficient PA among young people is a major health problem worldwide (Hallal *et al*., 2012). A review of the literature has shown that a lack of PA and high amount of Sedentary Behaviour (SB) are related to a greater prevalence of non-communicable diseases, such as obesity, which can result in increased mortality (Ekelund *et al*., 2012). The development of successful interventions to increase childhood PA, and reduce the amount of time children spend on SBs is currently a major research priority (Sallis *et al*., 2006).

According to authors, such as Pate *et al*. (2006), schools play an important role in promoting PA levels and decreasing the time spent on SBs among children. International public health organisations, such as the Pan American Health Organisation (Pan American Health Organisation, 2011), have emphasised the need to design and implement global strategies at school level in order to promote healthy lifestyles. In addition, these organisations indicate

the need to analyse elementary and middle school curricula to include educational activities and PA. In this regard, school-based PE has a clear role in promoting a healthy and active lifestyle outside of school (Haerens *et al*., 2011).

The use of printed materials plays an important role in promoting active lifestyles (Marcus *et al*., 1998). Furthermore, according to the literature, printed materials are methods that promote knowledge of ideas, values and norms (Vallance *et al*., 2008). Additionally, they have been identified as predisposing factors in promoting PA and have been widely used as educational tools for promoting public health. Marks *et al*. (2006) observed that printed workbooks were effective in increasing the levels of PA among a North American sample of middle school learners. The authors concluded that traditional print formats might provide a more effective context than an identical content website for increasing PA intention and behaviour.

Focusing on the school context, textbooks can improve learning processes when they function as key educational tools that guide the construction of the school curriculum (Montagnes, 2000). In this respect, textbooks have undergone different types of analysis, most notably those related to their implicit and explicit content (Brugeilles & Cromer, 2009). According to Taboas-Pais and Rey-Cao (2012b), the relevance of evaluating the content of textbooks lies in the large capacity that they have to convey ideas and feelings from one person to other. Content can work as a control mechanism that promotes non-reflective acceptance of thoughts and reproduces stereotypes without questioning their validity. For instance, the role of textbooks in promoting healthy habits has been analysed in previous research.

Kosonen *et al*. (2009) analysed the pedagogical properties of Finnish health education textbooks at primary and secondary education levels. The authors determined that the approach that textbooks took gave learners the opportunity to build critical skills and recommended a greater focus on health promotion through critical training, to help promote healthy habits and lifestyles in learners. In the Spanish context, a study on health education was conducted with textbooks from different subjects at primary and secondary school levels. It was concluded that the promotion of PA as an option to promote a healthy lifestyle was not observed in these curricular materials (Gavidia, 2003).

Even though several studies have analysed health topics in school textbooks on different subjects, PE textbooks have rarely been examined. A review of the literature that focused on analysing the content of PE textbooks reveals gender differences in which the male gender model is clearly predominant in pictures and female images are stereotyped (Browne, 1990; Taboas-Pais & Rey-Cao, 2012b). Other studies on the subject have examined the image of disability in PE textbooks and their results indicated that people with disabilities were not usually represented in pictures and, females with disabilities were less represented than males with disabilities (Taboas-Pais & Rey-Cao, 2012a, b). There are also other studies that have analysed the content of textbooks, taking the age variable into account. Taboas-Pais *et al*. (2013) noted that older people were under-represented.

When the kind of PA represented in the PE textbooks is analysed, it is customary to speak of types of activities based on the usual content of PE (sport, fitness activities, artistic activities,

activities in nature, etc.), or types of sport activities (individual vs. team sports; elite vs. non-elite) (Taboas-Pais & Rey-Cao, 2012b; Taboas-Pais *et al*., 2013).

Within the body of literature on health promotion, PA is considered as a complex set of behaviours and is usually evaluated taking into account the domains or settings where activities occur (Bauman *et al*., 2006). The main four domains of active living are active recreation or leisure-time PA [LTPA] (exercise, sport, active school recess, etc.); occupational PA through work or occupations; household or domestic activity (housework, gardening, etc.); or active commuting (AC) to get to places, including travel to and from school. In addition to these domains, SBs are commonly analysed and usually involve sitting, such as watching television (TV) or using a computer (Bauman *et al*., 2006).

PURPOSE OF THE STUDY

There is a lot of current interest in, and extensive research on, the role of the different domains or locations where activities are carried out in the promotion of active lifestyles (Sallis *et al*., 2006; Molina-García *et al*., 2015). However, there is a lack of research addressing how PA domains are represented in PE textbooks and, therefore, examining what PA patterns are predominantly transmitted to school learners. Furthermore, there is also a need for a more thorough study of the relationship between each PA domain and gender stereotypes, different age groups, or the presence of a disability.

The goal of this study, therefore, was to evaluate how PA domains are represented in images published in Spanish PE textbooks. In addition, gender and age variables and the presence of disability, were considered in this analysis. The availability of PE learner textbooks has increased in Spain in recent decades and 23.2% of teachers use them as classroom material (Peiró-Velert *et al*., 2015).

METHODOLOGY

Sample

To obtain a sample of Spanish elementary PE textbooks, the most important publishing houses in Spain were searched, following the *Panoramica de la edición española de libros 2012* as a guide (Ministerio de Educación Cultura y Deporte, 2013). As a result, the sample selected included the 5 most popular Spanish publishing houses for the 2010 to 2012 period (Santillana, Edelvives, Paidotribo, Anaya, and Bruño), who produced 30 textbooks. 10 primary PE textbooks were randomly selected for analysis based on 3 criteria, namely that the textbooks were for primary PE, presented in Spanish and published in Spain between 2010 and 2012. A simple random sampling procedure was followed. The 30 textbooks were numbered and a table of random numbers was employed to select them. Therefore, each textbook had the same probability of being chosen.

The analysis was restricted to images of the human body, while animals with human characteristics, fantasy characters and fabricated characters were not included in the analysis. After taking a count, the total number of images with humans in these 10 textbooks totalled 1,094. From this, a representative sample was taken from the total population, and using a confidence level of 99% and a margin of error of 6%, 336 images were analysed. This sample

was taken randomly (simple random process), for each textbook using a table of random numbers. Once all the images were numbered, a random selection was made culminating with a choice of 32±2 images per textbook. The initial sample consisted of 336 images, but 45 were discarded because it was not possible to identify the age and gender of the subjects. For each image, the most prominent characters or group of characters were recorded.

Analysis of images and coding scheme

An analysis was performed on each image following a coding scheme, which was constructed by the research team following guidelines from previous studies (Fitzpatrick & McPherson, 2010; Taboas-Pais & Rey-Cao, 2012b; Molina-García & Martínez-Bello, 2014; Martínez-Bello & Martínez-Bello, 2016). Having defined the categories and indicators, 2 experts who promote PA and PE evaluated the categories and indicators. Once the coding scheme system had been discussed independently by these experts, it was rewritten based on their feedback. The final coding scheme had 5 categories, namely *PA domains*, *gender*, *age*, *time* and *disability*. Each unit of analysis (image) was coded by choosing 1 indicator from each of the categories. Indicators and operational definitions (activities) for each category are presented in Table 1.

Table 1. **CODING SCHEME FOR ANALYSIS**

Categories	Indicators	Descriptions
Physical activity domains	1. Sedentary behaviour or low activity	'Awake' activities when sitting, lying or standing that involve low energy expenditure.
	2. Active commuting	Physical activities, including cycling or walking, as a way to get to places.
	3. Occupational activity	Physical activities through work or occupations.
	4. Physical education class (educative context)	Activities framed in the physical education classes that take place at school.
	5. Leisure-time physical activity	Physical activities for exercise or recreation that can be organised, such as team or individual sports, or non-organised, such as traditional games or recreational sports.
	6. Household physical activity	Physical activities in a household setting such as gardening or child minding.
Gender	1. Male 2. Female 3. Group of females & males	The image shows one or more people whose basic characteristics represent males or females based on clothing, hairstyle, presence or absence of facial hair, physical stature and other distinguishing characteristics.
Age of character	1. Children 2. Adolescents 3. Adults 4. Older adults	The image shows one or more people whose basic characteristics represent different ages based on appearance and behaviour, such as adult-like facial structures, clothing, occupational context and other distinguishing characteristics.

Table 1. **CODING SCHEME FOR ANALYSIS *(continued)***

Categories	Indicators	Descriptions
Time	1. School time 2. School-break time 3. Outside school time 4. Undetermined	Activities occur during school hours (not including school recess), at school recess time or after school hours. The classroom, school gym and playground are the usual locations for school time and school-break time.
Disability	1. Non-disability 2. Disability	The images show one or more people whose characteristics represent a physical, sensorial or mental impairment.

In particular, indicators and operational definitions of the PA domains category were developed taking into account previous studies on the promotion of active lifestyles and the analysis of SBs among youth (Marshall *et al*., 2002; Bauman *et al*., 2006). SB was defined as any 'awake' activity that involves energy expenditure when sitting or lying down less than or equal to 1.5 metabolic equivalents [METs] (Barnes *et al*., 2012).

Both seated and standing positions were included, such as traditional children's and board games (playing with 'bottle caps' or card games) or motionless standing. These activities are usually classified as very light or light intensity activities (<3METs) (Ainsworth *et al*., 2000). The activities included in the AC, LTPA, occupational activity and household PA categories involve at least a moderate intensity activity (≥3METs) in accordance with reports from Ainsworth *et al*. (2000) and the Centres for Disease Control (Centres for Disease Control, 1999). The Compendium of Physical Activities (Ainsworth *et al*., 2000) was used for the image coding process.

Procedure

The process of image analysis was performed using a triangulation method with an observational group. This observational group was different from the experts who participated in the process of building the coding scheme. 3 coders (Primary pre-service PE teachers) in the observational group were trained on the coding scheme following previous studies (Fitzpatrick & McPherson, 2010; Taboas-Pais & Rey-Cao, 2012b). During the practice coding training, reliability was monitored and informally assessed. The observational group was trained on 2 different days for 1 hour in order to clarify uncertainties about the process. On the first day, the researchers explained the objectives of the research project and the coding process.

On the second day, the coders analysed 3 example images in order to clarify questions about the coding process. The categories and indicators in the coding scheme were checked with the observational group. The image was put on the desk and 1 member of the research group read each category containing the list of indicators. After each image was discussed, the observational group decided 1 indicator for each of them, requiring about 1 to 3 minutes per image. When it was not possible to reach an agreement, the category was coded as unclear. During the discussion of each image, the researchers encouraged the coders to challenge one

another's perspectives when there was not agreement. When a response differed from the other coders, the researchers asked the coder to clarify further his/her position.

Following the training process, the final coding was performed following the same procedure. 10 sessions (of 2 hours each) were required to analyse all of the images. Interference by the research team was minimal and they only focused on presenting the images and reading each of the categories and indicators. For each image, the observational group worked to achieve agreement, but when it was not possible (less than 5% of the total), the indicator was coded as non-identifiable.

Analysis of data

For the statistical analysis, a contingency table was constructed using the *PA domain* as an independent variable against the dependent variables of *gender*, *age* and *disability*. The *time* category was used descriptively. To define a statistically significant probability only p-values less than 0.05 were accepted. The Statistical Package for the Social Sciences (IBM, 2014), version 22, was used for the analysis.

RESULTS

The frequency and percentage of representation of the different PA domains in the sample is shown in Table 2. The most frequent indicators were LTPA and SB or low activity domains, accounting for 42 and 36% of the total respectively. Of the total sample, 16% were of PE class and 5% were depicted as active commuting (AC). There were no images based on occupational activity and household PA domains.

Referring to the gender category in Table 3, the results show that of the 123 LTPA domain images, 52% were male, 28% were female and 20% were depicted as a group of males and females. Of the 105 images represented as SB or low activity domain behaviours, 38% were male, 33% were female while 29% were represented as a group of both females and males. Of the 48 images represented as PE class, 58% were depicted as a group of females and males, 25% were females and 17% were males. Finally, of the 15 images represented as AC, 53% were males, 27% were females and 20% were groups of females and males. The Pearson chi-square test performed showed a statistically significant difference between PA domains and gender (χ^2 =29.821, df=6, p<0.001).

There was a higher representation of children in the PA domains (Table 3). In particular, of the 123 images of LTPA, 82% were children and 18% were adults. Of the 105 images of SB or low activity, 95% were children and 5% were adults. Of the 48 images of PE class, 100% were depicted as children. Finally, of the 15 images of AC 87% were children and 13% were adults. A Pearson chi-square test showed a statistically significant difference between the PA domain and age (χ^2 =17.272, df=3, p<0.01).

Table 2. **FREQUENCIES AND PERCENTAGES (%) OF IMAGES FOR SPECIFIC ACTIVITIES IN PHYSICAL ACTIVITY DOMAINS**

PA domains	**Activities [n (%)]**					**Sub-total**
Sedentary behaviour/ low activity	Standing motionless	Sitting activities	Academic activities	Static traditional games	Other activities	
	29 (10%)	29 (10%)	12 (4%)	9 (3%)	26 (9%)	105 (36%)
Active commuting	Walking	Others				
	9 (3%)	6 (2%)				15 (5%)
Physical education class	Sedentary/low intensity	Moderate-vigorous intensity				
	29 (10%)	19 (66%)				48 (16%)
Leisure-time physical activity	Sport	Leisure & traditional games	Physical exercise	Physical artistic activities	Other activities	
	58 (20%)	21 (7%)	12 (4%)	6 (2%)	26 (9%)	123 (42%)
Total count: 291 (100%)						

The time category in Table 3 shows that of the 105 images of SB or in the low-activity domain, 29% were portrayed after school and 11% at school, but this was not determined for 60% of the images. Of the 123 LTPA images, 33% were portrayed after school, whereas this was undetermined in 67% of cases.

Finally, Table 3 shows that only 2 images were coded as bodies with a disability. In particular, of the 48 images of the PE class, 96% (46) were depicted without a disability and 4% (2) with a disability. None of the 29 adults was depicted with having a disability.

DISCUSSION

Analysis of PE textbooks in this study showed that the representation of different PA domains is not balanced. In relation to LTPAs, there was a high percentage (42%) of representation for these types of activities. This finding supports what is reported in the literature on the promotion of active lifestyles among young people, which suggests that promotion of LTPA is a good strategy for this age group (Sallis *et al*., 2012).

Table 3. **IMAGES BASED ON PHYSICAL ACTIVITY DOMAINS: CONTINGENCY TABLE FOR PHYSICAL ACTIVITY DOMAINS FOR GENDER, AGE, TIME AND DISABILITY**

Physical activity domains	**Gender [n (%)]**				**Age [n (%)]**			**Time [n (%)]**				**Disability [n (%)]**		
	Males only	Females only	Males & females	Sub-total	Children	Adults	Sub-total	School time	After school	Undetermined	Sub-total	Non-Disability	Disability	Sub-total
Sedentary or low activity	40 (38%)	35 (33%)	30 (29%)	105	100 (95%)	5 (5%)	105	12 (11%)	30 (29%)	63 (60%)	105 100	105 100%)	- -	105
Active commuting	8 (53%)	4 (27%)	3 (20%)	15	13 (87%)	2 (13%)	15	– –	9 (60%)	6 (40%)	15 100	15 (100%)	- -	15
Physical education class	8 (17%)	12 (25%)	28 (58%)	48	48 (100%)	0 0	48	20 (42%)	1 (2%)	27 (56%)	48 100	46 (96%)	2 4	48
Leisure-time physical activity	64 (52%)	34 (28%)	25 (20%)	123	101 (82%)	22 (18%)	123	– –	41 (33%)	82 (67%)	123 100	123 (100%)	- -	123

After analysing the content of the images related to LTPAs, it was found that the main participants in these activities were males (male=52%, female=28%, group of males and females=20%) (Table 3). Current evidence indicates that there are gender differences in the representation of school activities in PE textbooks. Taboas-Pais and Rey-Cao (2012b) found that males were more frequently the protagonists in pictures about sport activities, especially for team sports.

Considering that the levels of PA tend to reduce with age, with the most significant decrease occurring during adolescence, especially for the girls (Kwan *et al*., 2012), it is particularly important to avoid non-fair representation of gender in textbooks for young children. The results of this study demonstrate the transmission of a dominant male model in PA undertaken during free time and emphasises the idea that LTPA is closely associated with the male gender. Therefore, the publishing houses should strive to better promote gender equality in their textbooks. On the other hand, as expected, pictures related to PE classes showed a well-balanced representation of both genders that can act to reinforce schools as co-educational contexts (Yoncalik, 2011; Taboas-Pais & Rey-Cao, 2012b).

The textbooks analysed in the current study did not transmit the idea that break-time is an excellent opportunity to increase PA levels among young people. According to the results, no pictures showed LTPA situations depicted at school break-time. This is in contrast to current recommendations that clearly indicate that break-time is a potential period for interventions aimed at improving the levels of PA and health among children (Chin & Ludwig, 2014). In contrast, the location of 67% of the pictures related to LTPA was identified as 'undetermined'. It means that it was not possible, by independent coders, to distinguish the place where the people were located. In addition, the location of 33% of the pictures related to LTPA was identified as 'after school', suggesting that the school was not portrayed as a space for the PA domain. It is important to keep in mind that schools play a leading role in the promotion of active lifestyles, not only through teaching their own subjects, such as PE, but also by making it easier for students to be more physically active during the school day (Pate *et al*., 2006). Because children spend almost a third of their time at school, its role in creating active spaces must be strengthened. Hence, we advocate for the better representation of physically active situations during the school break-time in PE textbooks.

Analysis of the age variable in this study showed that children had the highest representation in the images during LTPA (children=82%; adults=18%) (Table 3). This result corresponds with the data from the analysis of preschool textbooks (Molina-García & Martínez-Bello, 2014). In contrast, the elderly was not represented in the images analysed in this study, which correlates with data from Taboas-Pais *et al*. (2013) that analysed Spanish secondary school PE textbooks. Furthermore, given the reduced portrayal of older people doing LTPA, it is argued that these printed curricular materials reinforce the existing negative stereotypes of old age. We agree with Taboas-Pais *et al*. (2013) that the absence of older people in these images creates negative ideas about old age, for instance that older adults are not able to participate in PA or that the young body is more superior at sport.

Furthermore, the results indicate that adults were not represented in the pictures related to LTPA. In general, the images show situations after school where parents do not usually exercise with children. It is already known that family support for the practice of PA is one of

the main determinants of PA among young people, mainly because parents have a significant function as role models when they exercise with other family members (Moore *et al*., 1991). The images presently used in PE textbooks do not represent the leading role that family members play in PA practice during out-of-school time. It can be recommended that new versions of these textbooks include more pictures depicting children doing PA with family members.

Similarly, the presence of disability is almost non-existent in the images analysed from PE textbooks. Only two images with a disability were portrayed (Table 3) and these results are in accordance with those found in preschool (Martínez-Bello & Martínez-Bello, 2016) and secondary school textbooks (Taboas-Pais & Rey-Cao, 2012a). Some authors, such as Hardin and Hardin (2004), describe the habitual dialogue surrounding PE at school as part of a non-inclusive context, and refer to the role of the hegemony culture in sport as one of the main reasons for the exclusion of disabled people. Publishing houses should become aware of the need to include more disabled people in their textbooks and by showing pictures of inclusive participation of people with and without disabilities during PA practice (Taboas-Pais & Rey-Cao, 2012a).

Commuting to school offers another important opportunity for incorporating PA into students' daily routine (Molina-Garcia *et al*., 2010). It has been used, together with the promotion of the active use of leisure time, to improve PA levels among those of school age (Sallis *et al*., 2012). Authors, including Pabayo *et al*. (2010), assert that AC among school learners must be encouraged and integrated at a young age to be reinforced later. Unfortunately, there were almost no messages promoting AC in the images analysed from PE textbooks in this study. Only 15 images were coded as AC (Table 3). Tranter and Sharpe (2012) demonstrated the positive role such messages had in movies to promote AC in children. As pictures are elements that attract children's attention (Selander, 1990), it is important to consider the inclusion of pictures about AC at school, mainly to encourage adopting these behaviours in secondary school.

The findings of this study clearly show the normalisation of SBs in PE textbooks (36% of the images were coded as SB or low activity) (Table 2). As already known, sedentary leisure-time has increased dramatically among young people in recent decades (Trost *et al*., 2003). The time that children devote to SB activities, such as watching TV, is a significant predictor of body weight increases (Jago *et al*., 2005), because calorie consumption is frequently higher in these kinds of situations (De Craemer *et al*., 2012). However, one positive aspect that was noted in this study was the low occurrence of pictures that depict children participating in technological SB leisure activities (watching TV or playing videogames).

One of the main limitations of this study is that only Spanish textbooks were examined. Future studies should be done using PE textbooks (especially in elementary and primary education), from other countries and in different languages. In the same way, it would be interesting to carry out intervention studies in which the connection between the use of different PE textbooks and PA behaviours can be analysed.

PRACTICAL APPLICATION

Based on the present findings, PE teachers should be made aware of the imbalance of images according to gender, age and disability in elementary and primary textbooks. It is recommended that teachers in Spain review textbooks carefully with an eye towards both content and images prior to adopting a text. The goal should be to select textbooks that depict under-represented persons engaged in PA in multiple settings.

CONCLUSIONS

The school sector has been identified as an essential element in the promotion of PA by implementing programmes and using quality educational materials (Sallis *et al*., 2012). The curricular materials, and especially textbooks for children, currently characterise the social and cultural reality, including its inadequacies, gender stereotypes and other types of parodies (Brugeilles & Cromer, 2009; Martínez-Bello & Martínez-Bello, 2016). This is why the content of implicit and explicit messages in school textbooks must be analysed. Statistically, significant differences were found in this study between PA domains and gender. The textbooks analysed did not promote gender equality. This has implications for building and reinforcing gender-sensitive curricula specifically in PE. Moreover, a significant difference between PA domains and age was found. In this respect, given the reduced portrayal of older people, it is argued that PE textbooks reinforce the stereotypical beliefs of a hegemonic conception of able-bodiedness related with age.

On the other hand, Sääkslahti *et al*. (2004) found that the use of printed school materials in a PA promotion programme for children could modify their PA patterns significantly. These materials should show specific messages, especially in the images, to make them truly educational in the transmission of health promotion messages (Clark *et al*., 1999). Besides this, as also indicated by Vallance *et al*. (2008), printed educational resources on PA should include information consistent with the current public health guidelines.

From the point of view of the promotion of PA, the results of the present study emphasise the need to reduce the normalisation of the SBs in PE textbooks and to increase the presence of images related to PA during the school break-time as well as active commuting. Considering textbooks as resources that transmit meanings, current textbooks are not creating models that are sufficiently strong enough to promote PA in accordance with the current public health recommendations. This has also been indicated in the literature. Likewise, it suggests the need to keep the imbalance in the representation of gender, age, and disability variables to a minimum in the varied contexts where PA takes place.

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(Subject Editor: Dr Niekie van der Merwe)