Original Article

Analyzing physical activities in the natural environment and their influence on the motivational climate of classes

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Abstract

Students are increasingly disconnected from the practice of physical activity in the natural environment that surrounds them. The objective of the present study is to analyze the impact of working in the natural environment on the motivational climate among classmates and the situational motivation of secondary school students in Physical Education (PE) classes in Spain. A Teaching Unit (TU) on knotting was conducted at a sports centre (control group) and in a nearby park (experimental group). In all, 226 students from the third and fourth year of Compulsory Secondary Education [*Educación Secundaria Obligatoria*] (ESO), with an average age of 14.52 ± 1.51 years in age, participated in the study. A quantitative methodology was used that applied an inferential analysis through the design of repeated pre-test/post-test measures and a Bonferroni test with each of the groups. The results showed that the students from the experimental group presented significance levels that were more favourable for situational motivation, both in the pre-test ($p = .023$) and in the post-test, than in the control group ($p = .036$). The students with the highest mark for PE in the previous term valued their experiences in each of the groups ($p = .019$) in the experimental group and ($p = .042$) in the control group, while differences in the experimental group were also found in their practice of physical activity in the natural environment ($p = .029$). The study concludes with the idea of the importance attached to exploiting nearby resources and natural spaces with the purpose of enjoying other contexts and enhancing both motor skills and personal relations.

Keywords: natural environment; motivation, physical education; student perceptions.

Introduction

Some experiences in educational and social contexts have brought to light the exponential decline over the past decade in the practice of physical activities in the natural environment among school children (Frerichs, 2016). Although some years ago, a street, a backyard, a park and the green zones around towns were ideal areas for practicing sports in an independent and enjoyable way, today it may be seen how the activities and the places where adolescents enjoy their leisure time have changed (Doolittle, 2016). In short, free, creative and relational play, in the first stages of education, has been interrupted by more sedentary communicative models (with the exception of participation in federation-based and/or extra-curricular sports). In addition, this situation becomes a vicious circle, as the less we do for students to enjoy the natural environment that surrounds them, the less initiative they will have when experimenting and learning through different motor stimuli in varied contexts (Ferreira & Venter, 2016).

Faced with this reality, and rather than seeking to console ourselves by thinking that this is an irreversible situation, we have to value and to understand PE, as teachers of Physical Education (PE), as an ideal material to establish links with the natural environment, because the possibilities are limitless (Layne, 2014). In fact, it is not only a matter of establishing specific proposals in contexts where access is difficult such as the snow, the seaside, and woodland, but of thinking that a large part of the work that we normally apply in our classrooms can happen outdoors, in the open air. In brief, the main idea is to exploit the existing resources in the immediate surroundings of educational centres, which in the majority of cases are under used (Miguel-Aguado, 2015). Thinking of this type of transference to “outdoors” should be associated with a methodological task that involves students in decision-making, evaluation, the regulation of work and in reflections on the useful and real application of what has been learnt (Hortigüela, Pérez-Pueyo & Moncada, 2015; Hortigüela, Fernández-Río & Pérez-Pueyo, 2016; Hortigüela, Pérez-Pueyo & Fernández-Río, 2016). Therefore, the reduced curricular weight that physical activities in the natural environment have in the school curriculum, and the lack of training on the topics that PE teachers express, cannot serve as an excuse to limit the range of possible motor skills of our students (Sallis, Johnson, Calfas, Caparosa & Nichols, 2013). If we wish PE to be associated with enjoyment, experimentation of the practice of physical activity in other contexts and for the student to be aware of the possibilities that the environment offers, we should generate positive experiences outside the classroom. This

desire, in addition, is intrinsically associated with the student respecting the environment, understanding it as the most suitable common area for practice, knowing the risks that might arise from it, and in consequence adapting the necessary safety measures and showing responsibility (Diedrich, 2014). What appears evident is that the more experiences the student has from the start of changing environments, the more capable the student will be of relating physical activities in the natural environment with both health and quality of life (Ridgers, 2012). In this sense, and despite the diversity of didactic experiences in the natural environment for the PE student, there is little literature that shows scientific evidence of experimental designs to investigate student perceptions of their personal experiences. Therefore, the contribution of this investigation centres on obtaining results relating to student perceptions through the completion of a practical exercise with applications: knot tying (knotting). Hence, the objectives of the investigation are: a) to contrast the effects of the motivational climate and the situational motivation of students in the course of completing this didactic content in the natural environment with regard to their practice in the sports centre (inside); b) to confirm the impact of the variables of extra-curricular sporting practice, the practice of activities in the natural environment, and to grade satisfaction with the experience in each of the groups in the PE classes.

Material and Methods

Participants

In all, 226 students participated in the study (110 men and 116 women) from eight natural groups from the third and fourth academic year of Compulsory Secondary Education [*Educación Secundaria Obligatoria*] (ESO), with an average age of 14.52 ± 1.51 years. They were all attending an institute of secondary education in the provincial capital Burgos, Spain. 103 students (48 male and 55 female adolescents) completed the TUs on knotting in the natural environment (experimental group), while 123 (62 male and 61 female adolescents) did so in the sports centre. The two groups were shared by the same teacher. Convenience sampling was employed, due to the ease of access to participants and the ease with which the researchers could access the data. Among all of the students, 53 had completed extra-curricular physical activities over three years, 88 between one and three years, and 85 had completed no extra-curricular physical activity. With regard to the grade awarded for PE in the preceding term, 106 students had obtained a higher grade than 7, 98 between 5 and 7, and 22 had failed. In relation to the experience of physical activities in the natural environment, 49 students stated that they practiced physical activity more than three times a month in the natural environment, 66 between one and three times, while 111 did none.

Instruments

Quantitative

Escala de Percepción del Clima Motivacional [The Scale of Perceived Motivational Climate] (*EPCM*). An adaptation of the version translated into Castilian Spanish by Gutiérrez, Ruíz & López (2011) of the original instrument (Biddle et al., 1995). The responses were gathered on a Likert-type scale with a range of scores from 5 (totally in agreement) to 1 (totally disagree). There were 19 items in the questionnaire. The following introduction preceded the introduction: "The knotting exercise". Two factors were measured, the task-related climate (twelve items) for example, item 11: "the students learn new things and feel satisfied" and the ego-related climate (seven items) for example, item 7 "The students feel satisfied when they do it better than the others". It yielded a high FC = .87 and a VME higher than .50 (50.45%). The Cronbach's alpha of this scale was .92. A confidence level of 95% was applied.

Escala de Motivación Situacional (SIMS-14) [Scale of Situational Motivation]. The SIMS (Guay, Vallerand & Blanchard, 2000) was employed, validated in the Spanish context and adapted to EF (Julián, Peiró-Velert, Martín, García & Aibar, in press). The responses were collected on a Likert-type scale, with a range of scores that fluctuated from 5 (totally agree) up to 1 (totally disagree). There were 14 items in the questionnaire. The students responded to the question: "Why have you participated this year in the knotting teaching exercise?" Four factors were measured, *intrinsic motivation* (four items), for example, item 2: "Because I think it is interesting"; *identified regulation* (three items), for example, item 5: "What I have done for my own good"; *external regulation* (three items), for example, item 9: "mind in disagreement"). There are fourteen items in the questionnaire. The students responded to the following question: why have you participated this year in the knotting exercise Teaching Unit (TU)? Four factors were measured, *intrinsic motivation* (four items), for example, item 2: "Because I think it was interesting"; *identified regulation* (three items), for example, item 5: "I did it for my own good"; *external regulation* (three items), for example, item 9: "Because I suppose I had to do it"; and, *demotivation* (four items), for example, item 12: "I participated, but I'm not sure whether it's worth it". A high FC = .88 was obtained and a VME higher than .50 (50.89%). This Scale presented a Cronbach's Alpha of .85. A confidence level of 95% was applied.

An exploratory factorial analysis was performed with the two instruments that revealed a solution of two definitive factors with an eigenvalue higher than one. These two factors explained the total variance, once the component matrix had been corrected and rotated (Normalized Varimax Rotation). The initial eigenvalue for the first factor corresponded to 31.375% of the variance and the second to 26.731% of the variance. In addition, with the purpose of testing the degree of adjustment of the two questionnaires to the sample that was used, a PCA confirmatory factor analysis was performed, so as to evaluate the goodness of fit of the data. Acceptable values

were obtained for the KMO (Kaiser-Meyer-Olkin) of .834 and Bartlett's test of sphericity ($p > .00$). This test presented a Chi-squared value of 118.164 and 11 degrees of freedom. The indices obtained in the covariance matrix, presented satisfactory adjustments for the Root Mean Square Error Approximation (RMSEA) = .063. In this index, the values lower than 0.05 indicated a good adjustment, and values of up to 0.08 represented reasonable errors of approximation (Herrero, 2010). In the *Comparative Fit Index* (CFI) and the Goodness of Fit Index (GFI), a value of 0.85 was reached, and an indicator of goodness of fit of 0.92 (Hu, & Bentler, 1999).

Likewise, the individual validity of each one of the items was examined through the estimation of the contribution of the item to the factor assigned through the regression weight. The t-values associated with each of the estimations were taken as the measure of the contribution. This value is the coefficient between the parameter of estimation without standardization and the standard error (coefficient of regression). Values of over 2.00 were considered significant (Balaguer, Guivernau, Duda & Crespo, 1997) and a value of 2.08 was obtained.

Therefore, the two factors resulting from the study were:

- 1- Motivational climate between classmates: the aspects under analysis related to the involvement of students in their work and initiatives in the development of tasks, as well as student perceptions of the achievements thus far, individual and group responsibility for compliance with objectives, the teacher's assessment of the role of students, and the type of feedback provided throughout the process.
- 2- Level of situational motivation towards the TU: the aspects under analysis were linked to the degree of perceived interest by students, to the reasons that explain their participation, to the logic and the level of usefulness expressed in the experience, to willingness and causality when carrying out the tasks, and to the level of learning and in relation to other contents.

Design and procedure

The study involved a quasi-experimental design comparing pre-test/post-test equivalent (natural) groups, in which two validated questionnaires were used to obtain information from participants before and after participation in the TU. The same teacher taught the two groups with the same teaching methodology and only the context varied. This methodology was called the attitudinal style (Pérez-Pueyo, 2010) one of the emergent models of PE at present (Fernández-Río, Calderón, Hortigüela, Pérez-Pueyo & Aznar, 2016). The aims of this approach are the perception of group achievements, intentional corporal work, final group activities, reflection during the process and learning through motor skills.

This type of design raises two doubts (Campbell 1988): over their internal validity, which was minimized using natural groups of students (selected in accordance with the educational centres and not by the researchers), and on their external validity, to which a limitation was sought through a considerable number of participants, explaining the procedure followed in detail, so that it could be transferred to other educational centres. The TU was implemented in the second term of the academic year, both in the experimental and in the control group. The only difference was that the activities with the experimental group took place in a natural zone of trees and the activities of the control group in the sports centre. The duration was of 10 sessions in each of the groups. This is the (context) effect that we wish to measure on the perceived motivation of students after finishing the experience.

The TU consisted of the following: through learning how to tie three knots (bowline, directional figure 8 loop, and clove hitch), and using a mobile pulley system, a rope anchored at two fixed could be stretched to maximum tension. In the experimental group, two trees were used, while in the control group two circular columns in the sports centre served the same purpose. Once that tension had been reached, and by tying only three knots, the class introduced various ropes, with the purpose of preparing stairs, swings, monkey bridges, and Tibetan bridges. On the basis of this learning experience, the students then prepared an entertainment space in which they all had to pass through an obstacle course. This exercise demonstrates one of the principal characteristics of the TU, the demonstration by the students of their learning throughout the process. In this way, the experimental group applied these teachings at the different trees that formed the natural working space, while those in the control group used fixed points in the sports centre.

In the first place, permission was obtained from the lead researcher of the Ethics Committee of the University, as well as from the educational centre at which the research was to take place. Subsequently, the informed consent of all the parents of the participating students. Finally, the students completed the questionnaires anonymously in a PE session (before and after following the TU). They were asked to answer the questions as truthfully as possible and were assured that their responses would not affect their grades in PE.

Analysis

A pre-test/post-test analysis was employed, testing the extent to which the fact of working in the natural environment might impact on the two factors under study. It should be clarified that the distribution of the observations by levels has been analyzed, confirming that no problems of constant variance existed that would alter the assumption of normality. Likewise, the assumption of independence between the variables in use was fulfilled.

A Repeated Measures Design (RMD) of a longitudinal nature was used, before and after the development of the TU, using a conditional model. A two-way mixed Anova for independent groups was used. A Bonferroni test was also completed for each of the independent variables under analysis (practice of sporting activity, academic result in PE and level of practice of physical activity in the natural environment) in relation to the evaluation of the activity experienced in each of the groups. The statistical analysis was done with the SPSS (version 22) software package. After completing the Kolmogorov-Smirnov test ($n > 50$), and accepting the null hypothesis ($p = .156$), the sample responded to parameters of normality. This approach entails the use of parametric tests in the inferential statistical analysis.

Results

Inferential analysis: Anova of the two mixed channels with repeated measures for independent groups

Table 1. Comparison of measures by factors for each of the groups in the pre-test/post-test.

	PRE-TEST			POST-TEST				
	Average	S.D.	Var.	Average	S.D.	Var.	F ¹	F ²
Experimental Group (A)								
F.1. Motivational climate among classmates	3.87	.54	.29	4.21	.36	.12	-	-
F.2. Level of situational motivation towards the Teaching Unit	3.76	.61	.37	4.82* ^{aa}	.41	.16	.82	-
Control Group (B)								
F.1. Motivational climate among classmates	3.85	.56	.31	3.96	.52	.27	-	-
F.2. Level of situational motivation towards the Teaching Unit	3.92	.76	.57	3.99** ^{*ba}	.55	.30	-	.85

Note: Different superscript between groups indicate significant differences at a level of $p < .05$; f^1 : pre-test/post-test effect size; f^2 : size effect between (experimental and control group) post-test.

*Differences between the pre-test and the post-test in group A in factor 2

**Differences in the post-test between group B and A in factor 2

No significant differences were observed in the pre-test between the groups for any of the two factors. Significant differences were solely found in the experimental group for the factor situational motivation, both in relation to the pre-test ($p = .023$; $f^1 = .82$), and in the post-test with regard to the control group ($p = .036$; $f^2 = .85$). The experimental group presented improvements in the two factors once students had attended the TU. However, this increase was less in the control group. The highest value was found in the factor for the level of situational motivation in the post-test for the experimental group with an average of 4.82.

Inferential statistical analysis: Anova (Bonferroni) test for each of the independent variables under analysis

The variable referred to as “personal valuation of the experience” was generated as part of the Anova analysis, taking into account the differences between the pre-test and the post-test in the two factors of study in both groups. This variable, used as a dependent variable, reflects the change that takes place. The impact of the independent variables on the variable may be verified from a) Previous experience in the practice of physical activities in the natural environment: 1-“none”, 2-“between 2 and three times a month”, 3-“more than three times a month”; b) Extra-curricular sports practice: 1- “none”, “between one and three years of practice”, 3- “more than three years of practice”; c) Grade in PE in the preceding term: 1- “failure”, 2- “between 5 and 7”, 3- “over 7”. In addition, a *post-hoc* test was conducted that indicated the groups in which that significant difference was found (see table 2).

Table 2. Influence of the independent variables “Previous experience in the practice of physical activities in the natural environment “Extra-curricular sports practice” and “Grade in PE from preceding term” in the valuation of the experience the students have lived.

PERSONAL VALUATION OF THE EXPERIENCE	F	gl	p
Experimental Group			
Previous experience in the practice of physical activities in the natural environment	97.54	2	.029*
Extra-curricular sporting practice	82.15	1	.195
Grade in PE in the previous term	76.79	1	.019**
Control group			
Previous experience in the practice of physical activities in the natural environment	102.16	2	.243
Extra-curricular sporting practice	96.79	1	.139
Grade in PE in the preceding term	78.73	1	.042***

* $p < .05$ between “none” (average 3.65) and “more than three times a month” (average 4.87)

** $p < .05$ between “failure” (average 3.53) and “over 7” (average 4.45)

*** $p < .05$ between “failure” (average 3.25) and “over 7” (average 4.12)

In each of the groups, the students with higher grades in PE valued the activities they experienced more: both in the experimental group ($F_{(103)} = 76.79, p = .019$) and in the control group ($F_{(123)} = 78.73, p = .042$). The differences in the experimental group were found in their practice of physical activity in the natural environment ($F_{(103)} = 97.54, p = .029$). No significant differences were found in the practice of extra-curricular physical activity, with regard to the personal valuation of the experience in either group.

Discussion

It has been confirmed that the students from the experimental group obtained higher levels in the two factors under study; differences that were significant in factor 2 of the level of situational motivation towards the TU, both in relation to the pre-test and in the post-test, in comparison with the control group. In the same way, it was shown that the students from both groups with a higher PE grade in the previous term valued the experience more highly than those who had failed the subject. It was only in the experimental group that students who practiced more physical activity in the natural environment expressed higher positive perceptions towards the TU, in comparison with those who practiced none at all.

With regard to the first analysis, the fact that there were no intra- and inter-group differences in the pre-test reflected the balanced responses of students before the knotting activities, which was really positive when verifying the effects of the proposed factors. It has been reflected that the TU conducted in the natural environment was valued more highly by students, which demonstrates the positive impact that this fact has on both motivation between classmates and situational motivation in the context. This higher appraisal may be affirmed, after having completed exactly the same work in both groups, with the sole difference that trees and resources in the natural environment were used in the experimental group. As well as all of the previously recognized benefits in the scientific literature on conducting physical exercises in the natural environment - emotional wellbeing, empathy with the environment, a break from the routine, the form of organization of leisure, and free time-, the addition of the motivational factor of both the group and the context, as perceived by the students, may therefore be highlighted. This factor implies a really important step forward, as it is necessary to convince PE teachers that introducing these proposed exercises in the classroom requires no restructuring of the overall teaching proposal, but an adaption of what is normally done in the nearest context (Martin & Dawn, 2006). These results complement those of Ferreira and Venter (2016), who indicated that the completion of extra-curricular activities in the natural environment is one aspect that, among others, awakens most satisfaction and wellbeing in students. However, all these experiences with their psychological measurements have been linked to extra-curricular practices, very often managed through external firms. This externalization means that in many cases the connection with the learning achievements in the PE class are lost, so we are unaware of the extent to which the positive effects that are noted may at least in part be due to the PE classes (Richards, Aros & Ostrander, 2015). In the present investigation, despite the improvements with the two factors in the experimental group, slight improvements were also observed in the post-test in the control group. This result indicates that the coherence of the proposed methodology of the TU was effective in both cases. In both groups, the aim is for the students to be capable of applying the knots they have learnt through the creation of tension between two fixed points, so that everybody can then enjoy what has been assembled. This situation generates motivation in the classroom, although as has been seen, it is in the experimental group where greater satisfaction is felt towards the experience. This may be due to the variety of stimuli in existence that are generated in the natural environment (trees, spaces, green zones...), which means that more positive student attitudes exist to apply what they have learnt (Navarro, Arufe & Sancosmed, 2015). Studies along these lines (Wahl-Alexander, Sinelnikov & Curtner-Smith, 2017) suggest that one of the most supportive factors in the practice of physical activities is the variety of contexts in which the activity takes place, where the natural environment is an inexhaustible source of resources.

One of the most notable results of this investigation has been to demonstrate the way in which the differences were significantly positive in factor 2 of situational motivation in the experimental group. In the first place, with regard to the pre-test, which reflects the positive effects of the TU. Permitting the students to practice rope-knotting activities to create bridges, ladders, and swings in the natural environment on the basis of experience awakens a greater interest in their surroundings, a higher level of participation in the study, a higher perception of the utility and the coherence of what they have learnt and a relation between the most potent contents. Finding differences in this factor with regard to the control group confirms that it is the context of the natural environment that produces these changes. In fact, it was the highest value with an average of 4.82. One of the things that has to be taken into account is that knotting is normally an area of knowledge with which students are hardly acquainted, so that this novel effect impacted in part on the satisfaction of the student when finishing the TU. Other proposals along these lines (Richards & Ressler, 2016) have also demonstrated the positive motivational interest that the students of PE expressed, when they had the opportunity to apply what they had learnt in the classes in other scenarios. This positive climate is attributable to the following factors: perception of achievement and of satisfaction towards the work completed, positive group feeling having overcome common challenges, novelty when breaking with routine in daily activities and being able to share work together in a team that they have prepared, before, during, and after the process (Sliwa et al., 2017).

With regard to the second analysis, the relation may be highlighted between the positive assessments towards the TU of those students with a higher PE grade in the previous term. This appraisal is found in both the control and the experimental group. It may be due to the active involvement that the TU requires, where motor skills alone are a means of obtaining satisfactory emotional results. Those students who understand PE as a subject in which they are only qualified by their motor skills are usually more reluctant when responsibility, commitment, and tasks outside of the classroom are asked of them (Gordon & Doyle, 2015). It has also been reflected in the investigation that the students who practice more physical activities in the natural environment valued the experience more satisfactorily than those who practice none at all. These patterns demonstrate a positive and direct connection between what is done in the PE classroom and the habits that the students have with regard to PE. A fact that is quite relevant, because it demonstrates the impact of what we teach and its transference with the interests of the students. Therefore, and as there are only a few hours in the week for PE classes, establishing this type of approach can guarantee greater physical activity in free time. As Thorburn and MacAllister (2013) pointed out, if we wish to reverse the continuing exponential growth of levels of sedentariness year after year, it is fundamental for PE, from an educational perspective, to connect with the increasingly changeable interests that adolescent students have. This change of perspective opens a wider spectrum of possibilities with the activities of the natural environment. However, this result was only obtained in the experimental group, due to the lower general valuations that were reached in the control group. No differences for the independent variable of sporting practice were observable in either of the two groups, which may be due to various factors: diversity of sporting disciplines that are practiced, scarce relation between those disciplines and the TU developed and/or the performance approach that is usually associated with extra-curricular sport. However, in other investigations in which sporting proposals have been implemented in PE classes at school, the variable of extra-curricular practice was decisive (Boylan & Renzulli, 2017).

Conclusions

In this section, a conclusion is advanced for each of the two objectives of the investigation. The contribution of the study, its limitations and the people to whom it may be of interest are also mentioned.

With regard to the first objective, the way that the group that participated in the Teaching Unit (TU) in the natural environment achieved improvements in both the motivational climate between classmates and in the level of situational motivation. In this last factor, significant differences were obtained both in relation to the pre-test and to the post-test between groups. In relation to the second objective, in the two groups, the students with a better grade in PE in the previous term presented a better valuation of the activities that they had experienced. In addition, in the experimental group, the students who practiced physical activity in the natural environment expressed more positive perceptions towards the TU that they had experienced. The level of extra-curricular sporting practice had no influence on this point.

The principal contribution of this investigation has been to confirm the positive influence that working with PE in the natural environment has on student motivation. In particular, through a TU of knotting exercises, where student involvement was high, when having to construct their own hanging bridges. The study presents some limitations. In the first place, a TU of only 10 sessions was completed, so for future investigations it would be pertinent to design more longitudinal studies. In second place, there was only one teacher who taught both groups. In future studies, more teachers from different centres could be involved, to limit the effects of conditioning variables such as teaching influence. We consider that the article could be of special interest for all those teachers of PE who provide teaching services both in the primary and in the secondary stage, as it could serve to encourage them to choose to conduct more activities in the natural environment. It would also be useful for people with responsibility for planning, design, and preparation of extra-curricular sporting activities at educational centres, reflecting on the importance of rediscovering the natural environment for the generation of positive learning experiences in students. The conclusions highlight the positive benefits of taking advantage of out-of-doors areas in the practice of physical activity; PE being an ideal area in which they may be exploited.

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