Journal of Physical Education and Sport ® (JPES), 18 Supplement issue 1, Art 71, pp. 497 - 502, 2018
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Assessing the impact of gender and sport practice on students 'performance required in team games.

FRANCESCO SGRÒ[1], SALVATORE PIGNATO[2], MARIO LIPOMA[3]
[1,2,3]Human and Society Sciences Faculty, University of Enna "Kore", ITALY
[1,2,3]Laboratory of Human Movement and Sport Performance Analysis, University of Enna "Kore", ITALY

Published online: April 30, 2018
(Accepted for publication April 19, 2018)
DOI:10.7752/jpes.2018.s171

Abstract
The assessment of learning progression in secondary school physical education curriculums is a very debate problem in literature, because it has been indicated as the fundamental shortcoming for identified adequate teaching model of sport games. The aim of this study was to assess the impact of gender and sport practice on the technical and tactical skills performed in three basketball and volleyball matches by secondary school students. The participants were physical education students (n= 32; age: 12.92±0.57 years) and they were involved in at least three matches of basketball and volleyball, respectively. The rules of the games were adapted according to the indications provided by the authors of Team Sport Assessment Procedure (TSAP), that was used for assessing the performance of each participant by estimating three parameters: efficiency index (i.e., offensive ability level), volume of play and performance score. For what concern the volleyball performances, the boys had higher efficiency index than the girls and the performances parameters over the three matches were stable. The analysis of basketball performance revealed that the boys had higher efficiency index and volume of play than the girls, and who practiced sport in extra-school time had higher level of volume of play. The stability analysis over three basketball matches resulted not stable for the considered parameters. These findings are fundamental for the teachers in order to design adequate and adapted programs for supporting the different level of skill development.
Keywords: invasion games; net/wall games; summative assessment; teaching games assessment; physical education.

Introduction

Fundamental Movement Skills are the baseline for supporting the growth of each child and are the main learning goals of pre- and primary-school physical education curriculum (Sgrò, Quinto, Pignato, & Lipoma, 2016; Sgrò, Quinto, Messana, Pignato, & Lipoma, 2017). In secondary school, the curriculum of the physical education courses is based on the teaching of the fundamentals of games and sports disciplines worldwide. The relative learning aims are preliminary designed according to sports classification system proposed by Mitchell and colleagues (2013): invasion games (i.e., soccer, basketball), net/wall games (i.e., tennis, volleyball), striking and fielding games (i.e., baseball), and target games (i.e., curling). About these sports, the invasion and the net/wall are the most popular among the children and young and the most teach during secondary school lessons (Otero-Saborido, Lluch, & Gonzalez-Jurado, 2015). In secondary school lessons the teachers should design their teaching and learning programs to focus on technical and tactical skills; anyway, from educational perspective, there is not a common orientation in literature about which is the most efficient teaching model for supporting the acquisition of knowledge and skills related to the aforementioned skills. Several teachers are oriented to teach only the technical skills required in each discipline by means of a command teaching style. Oslin and Mitchel (2006) supported the Games-Center Approaches (GCAs) that place the student at the centre of the learning experience that is focused on the intellective skills required to play sport discipline. Among the GCAs discussed in previous scientific studies, Teaching Game for Understanding model (TGfU) was originally proposed by Bunker & Thorpe (1982) as six-steps curricular model focused to teach knowledge and understanding of sport disciplines, but it missed of a pedagogical theoretical framework. Len Almond helped the former authors to improve the TGfU model by introducing four pedagogical principles: sampling, modification-representation, modification-exaggeration and tactical complexity (Thorpe, Bunker, & Almond, 1986). Anyway, although several studies have addressed the characteristics of the aforementioned model from pedagogical and didactic perspectives (Gutiérrez, Fisette, Garcia-Lopez and Contreras, 2014), there is not yet a common consensus that supports the adequate design of developmentally appropriate curriculum materials (Butler, Oslin, Mitchell, & Griffin, 2008) and the proper definition of a learning progression for teaching games and sports in school context. Moreover, Lever (1978) argued that gender differences need to be considered as critical factors when a teacher designs a curriculum that focused in sport and games. Recently, Harvey and Jarrett (2014) supposed that one of the reasons about the aforementioned lack of consensus is linked to the low availability of

Corresponding Author FRANCESCO SGRÒ, E-mail: francesco.sgro@unikore.it

research data acquired by means of authentic assessments of skill development and tactical awareness related to the learning aim taught in secondary schools. This consideration has been also supported by Otero and colleagues (2015), who underlined the need to promote the assessment of tactical skills beyond the technical skills in physical education curriculum oriented to invasion and net/wall sports and games. Actually, the methods used the most, designed and validated to assess players 'individuals performance in real-life learning scenarios are two: the Game Performance Assessment Instrument (GPAI) developed by Oslin and colleagues (1998) and the Team Performance Assessment Procedure (TSAP) developed by Grehaigne and colleagues (1997). Between the two methods, the TSAP is oriented to assess the offensive processes by means of performance indices used as proxy of specific learning aims and permits to encodes objective performance elements; GPAI quantifies the characteristics of decision-making skills and permits to encodes subjective decisions. Arias and Castejòn (2012) revised the literature about the use of TSAP and they identified that it was mainly used in physical education context and for assessing invasion and net/wall games. Anyway, several of these studies were oriented to discuss the TSAP from theoretical perspective (Richard, Godbout, Tousignant, & Grehaigne, 1999) and to verify the reliability and validity of TSAP original and adapted indicators (Nadeau, Goudbout, & Richard, 2008a; Nadeau, Goudbout, & Richard, 2008a; Otero, et al., 2014), since there are not specific learning data derived from the use of TSAP in real teaching-learning context.

Keeping in mind these considerations and limitations, the aim of this study was to assess the technical and tactical level of secondary school students involved in an invasion (i.e., basketball) and in a net/wall (i.e., volleyball) sport, respectively, by analysing the effect of gender and sport practice differences in such performance. Accordingly, we have hypothesized that the gender and the sport practice differences affected more the performances provided in the invasion game than the ones provided in net/wall game. Moreover, we hypothesized that the student's level of skill was more stable in the net/wall game performance than in the invasion ones.

Material and methods

Setting and participants

The participants were 32 students (23 boys; 9 girls; age: 12.92±0.57 years; height: 1.62±0.1 meters; weight: 60.20±15.26 kilograms) sampled from a secondary school located in the South of Italy. Following the conditions provided in TSAP validation study (Gréhaigne, et al., 1997), participants were divided in 8 teams and those teams were arranged by taking into consideration the children's developmental level in volleyball and basketball, respectively. Each team was included in a 4-teams group and played three matches. The assessments took place in April and May 2017 and were performed in the gym of the school. Prior of the assessments, each participant replied to simple questions (i.e., demographic analysis) about her/his past physical education practice and actually sport practice; furthermore, an operator acquired his/her height and weight. The proposed questions were: "Please, indicate if you had practiced regular physical education lessons throughout your primary school" and "Please, indicate if you do some club sport (at least two times per week) outside of physical education classes". Before the start of each match, the participants performed a low intensity warm-up program for 15 min, based on running at low speed, stretching and sport-specific exercises. The rules of volleyball and basketball matches were adapted according to the indications provided by Gréhaigne and colleagues (1997) in order to increase students' opportunities for game involvement and success with skill execution; furthermore, this approach was according to similar previous study conducted in educational environment (Gutiérrez, et al., 2014). Those rules have been explained to each participant from their physical education teachers during previous lessons. Participants provided parents-signed consent and the Ethical Committee of University of Enna and the Executive Board of the school approved the methodology used in this study.

Measurement

Performance measurement

The matches were video-recorded by means of two cameras (i.e., a GoPro Hero 5 and a Sony HDR-PJ740) located in the opposite corners of the two short-side of the gym, respectively, and such videos were then processed by four skilled operators. Those operators were physical education and sports specialists, with several years of expertise in volleyball and basketball, respectively. These specialists received six hours of preliminary training on the adequate use of TSAP procedure with video recording. Three additional hours beyond that training were oriented to describe the use of Longomatch software (Longomatch, ver. 0.20.8, http://www.longomatch.org), with the aim to improve the reliability and the validity of the aforementioned performance analysis procedures.

For all the analysed participants, the TSAP procedure allowed to the analysists to calculate the volume of play and the efficiency index parameters as proxy of specific learning goals. In this respect, each analyst noted whether a player received or conquered a ball and how he/she dealt with this possession. Table 1 presents the observational variables identified by Gréhainge and colleagues (1997) in the original version TSAP version and noted by the four operators.

Table 1. The TSAP observational variables noted by each analysist. The letter between bracket indicates the sport-specific meaning of each action (Adapted from Gréhaigne, et al., 1997).

Code	TSAP Variables	Actions	Learning goals
CB	Conquered Ball	1. Intercept a pass (B) 2. Stole a ball from an opponent (B) 3. Intercept an unsuccessful shot (B) or an unsuccessful spike (V)	Defensive skill of the participant
RB	Received Ball	1. Pass from a team-mate (V, B).	Level of involvement of the participant in the team's play strategies
NB	Neutral Ball	1. Routine pass to a team-mate (V, B).	
LB	Lost Ball	1. The ball pass to other team without scoring a goal (V, B). 2. The ball go out from the field (V, B).	Reduced occurrences describe the participant's ability to perform adequate possession strategies.
OB	Offensive Ball	1. Pass to a team-mate who performed a successful shoot (B) or spike (V) 2. Pass to a team-mate who performed a shoot (B) or a spike (V) which puts pressure to opponent player	Participant's ability to perform significant offensive strategies.
SS	Successful Shot	1. A successful shoot (B) or a spike (V) 2. A shoot which produce a new possession for the same team (V, B).	Participant's offensive ability.

Note. B= Basketball; V= Volleyball.

To estimate the volume of play (VP), analysts summed up all ball possessions (i.e., CB and RB) performed by each participant, while the efficiency index (EI) was estimate by means of the ratio of the all positive actions (i.e. SS, CB and OB) over all negative actions (i.e., LB). Finally, a performance score (PS) was estimated by means of the following formula: EI*10/ (VP/2) (see the original study of Gréhaigner and colleagues for more details about the use of the constants in the aforementioned formula).

Reliability

The intra- and inter-rater reliability analyses were conducted for basketball and volleyball matches, separately. Intra-raters percent of agreement between two procedures, with the second procedure provided with one month of distance from the first, varied from 92% to 95% for basketball assessment and from 95% to 98% for volleyball assessment, respectively. For what concern inter-rater analyses, the percent of agreement for the parameters PS, VP and IE ranged from 85% to 93% for basketball and volleyball, respectively.

Data Analysis

Preliminary, the data were screened for verified whether all the participants have performed three matches. Then, according to aforementioned hypothesis, the participants were grouped according to their gender and their level of sport experience as factors, distinctly. On the basis of three matches assessments, the mean values of the parameters IE, VP and PS were estimated for each participant and the resulted data were preliminary screened for univariate and multivariate outliers; normality assumptions were verified by means of Kolmogorv-Smirnov test. Multicollinearity assumptions were tested with correlation analysis, while homoscedasticity assumptions were verified by means of Levene's test of homogeneity of variance (Betz, 1987). For each sport discipline considered, a multivariate analysis of variance (MANOVA) was computed to test if IE, VG and PS parameters were different according to gender, sport practice as well as across the two factors; the main effects were also assessed. The effect size was estimated with Cohen's d_z and it was interpreted with the following criteria: small=0.20-0.49, moderate=0.50-0.79, and large>0.80 (Cohen, 1977). Finally, intra-correlation coefficients were computed for IE, VP and PS over three matches of basketball and volleyball, respectively, to verify the stability of performance.

Results

Demographic analysis revealed that 55% of participants were not enrolled in regular physical educations lessons during their primary school years, meanwhile 63% of participants reported doing sports activity during their extra-school time. The preliminary analysis revealed that only twenty-five children

performed three matches for each sport, since their data have been analysed in the current study. Then, the combined use of IE, VP and PS parameters resulted in a violation of multicollinearity and homoscedasticity assumptions, since the PS was excluded from further analysis. Because no other violations of assumptions were found, the further analysis were performed with parametric tests.

Volleyball Performance Analysis

According to the considered factors, Table 2 presents the descriptive statistics for the volleyball performance.

Table 2. Descriptive statistics of IE and VG in volleyball performance according to gender and sport-experience factors.

	GENDER				SPORT PRACTICE			
Parameters	*MALE* [19]		*FEMALE* [6]		*NO PRACTICE* [9]		*PRACTICE* [16]	
	M	SD	M	SD	M	SD	M	SD
IE	1.33	0.06	1.00	0.11	1.22	0.08	1.11	0.09
VP	23.13	1.34	19.25	2.22	20.20	1.72	22.17	1.94

Note: IE: Index of Efficiency; VP: Volume of Play; M=mean; SD= Standard Deviation

Multivariate statistics indicated no significant models according to gender (p=0.06), sport practice (p=0.25), and their interaction (p=0.09), respectively. According to gender, significant and large univariate difference was found for the parameter IE ($F(1,24)= 6.58$, p=0.01, $d_z=4.66$), since boys performed significant more efficient offensive actions than girls.

For what concern the stability analysis of IE, VP, and PS, the relative reliability coefficients (r=0.82, r=0.89 and r=0.88, respectively) were over the stability threshold (r=0.80) identified by Tritschler (2000).

Basketball Performance Analysis

According to the considered factors, Table 3 presents the descriptive statistics for the basketball performances.

Table 3. Descriptive statistics of IE and VG in basketball performance according to gender and sport-practice factors.

	GENDER				SPORT PRACTICE			
Parameters	*MALE* [19]		*FEMALE* [6]		*NO PRACTICE* [9]		*PRACTICE* [16]	
	M	SD	M	SD	M	SD	M	SD
IE	1.05	0.30	0.59	0.36	0.76	0.40	1.04	0.32
VP	37.90	11.11	14.66	9.83	22.66	14.00	37.75	12.34

Note: IE: Index of Efficiency; VP: Volume of Play; M=mean; SD= Standard Deviation

Multivariate statistics indicated significant model according to gender (Wilks's $\lambda= 0.60$, $F(2,20)= 6.57$, $p<0.01$, $\eta^2=.40$), while no significant models were identified for sport practice (p=0.86) and the interaction gender*sport (p=0.16), respectively. For what concern univariate effect for gender, significant and large differences were identified for the parameters IE ($F(1,24)=5.78$, p=0.02, $d_z=1.39$) and VP ($F(1,24)=13.60$, $p<0.01$, $d_z=2,25$), respectively. Boys seem to be able to produce more efficient offensive actions and to be more involved in the possession play than the girls. According to sport practice, significant and large univariate differences were found for the parameter VP ($F(1,24)= 5.14$, p=0.03, $d_z=1.22$), since who practice sport were highly involved in the possession play strategy.

For what concern the stability analysis of IE, VP, and PS, the relative reliability coefficients (r=0.68, r=0.68 and r=0.73, respectively) were under the stability threshold (r=0.80) identified by Tritschler (2000).

Discussion and conclusion

The aim of this work was to apply the Team Sport Assessment Procedure for assessing the level of technical and tactical skills in team sport of secondary school students. In detail, we hypothesized that the participants 'level of skill in two different typologies of sports varied according to gender and level of sport practice of each participant. Although the use of TSAP has been previous proposed in sport (Nadeau, et al., 2008a) and educational context (Otero-Saborido, et al., 2015), to the best of authors' knowledge, this manuscript extends the literature because it applies this procedure as proxy of a tool for the summative assessment of physical education learning aims in real teaching-learning environment.

The participants selected in this study were enrolled, for at least one year, in physical education courses focused to teach technical skills of several sport disciplines, as well as the ones required in basketball and volleyball; furthermore, five of them practiced basketball or volleyball during their extra-school times.

The assessment of volleyball performances revealed that the TSAP indices were not affected by the gender and sport practice in multivariate dimension and by the sport practice in univariate dimension, too. On the contrary, univariate effect was identified for the volume of play according to gender: boys played more possession strategies than the girls.

Volleyball is a sport categorised as "net/wall games" (Mitchell, et al., 2013) and it is characterized by a well-defined tactical schema, where each participant can move for a short range of its field. Furthermore, by considering the adaptation of the official rules used in the current study to improve the involvement of each participant, the chance to perform success actions with skill execution are less influenced by the gender differences, as previous stated by Lever (1978). At the same time, the boys, due to their different attitude to play in moderate-to-large group, although at least two of their team-mates were girls, were able to perform more possession play than the girls. The stability analysis of the performance indices (i.e., VG and IE) supports the homogeneity of skill level between team players and the authenticity of the assessment procedure. Since, the current adapted conditions and the limited number of analysed matches seem to reduce the fluctuations of the performance parameters. The previous statement is strictly related to the characteristics of volleyball tactic and possession strategy: although for its nature the team sport actions may have been subject to large variations related to team-mates and/or opponents' interactions, this evidence has not been identified in the current result.

The analysis of basketball performances revealed more significant differences than the ones of volleyball. MANOVA revealed a significant multivariate model for what concern gender factor. Univariate analysis revealed that the boys performed more efficiency actions and were more involved in possession play strategies than the girls, and the differences between genders were large. These results are in line with several indications provided by Lever (1978) about the impact of gender differences in sport performance during school period, because it confirms how, if needed (e.g., team offensive/defensive strategy), the boys are settled into the teammates cooperation and into the needs to coordinate their actions with those of their teammates in order to produce efficient offensive and/or defensive strategy. About the impact of sport practice, it seems to support the previous statement because boys resulted with significant and large highest level of involvement during the possession strategies than the girls. The boy usually spent their free-time to perform team sports and it seems to increase their ability to play as a superorganism with their teammates. Moreover, current results support the evidences provided by Harvey and colleagues about the relationship between the lessons of basketball in secondary school by means of tactical game model and the students' level of physical activity recorded during those lessons (2016). The stability analysis of basketball performances revealed that the assessed indices were not stable. The basketball is an invasion game characterized by physical, technical and tactical skills more complex than the ones required by volleyball and they seem to be influenced by the typical fluctuations which affect the sports based on high and frequently level of player's interactions with its teammates and/or its opponents.

About the educational perspective, the current evidences presented great importance for what concern the design of physical education curriculum in secondary school classes and the necessity to adapt the teaching processes to the different level of skills acquired by means for an authentic and valid assessment procedure. In this respect, in this study we have decided to enrol skilled assessors with expertise because the assessment by means peer-to-peer approach suggested by Grehaigne and colleagues (1997) (i.e., students-to-students) resulted with high level of criticism (Otero-Saborido, et al., 2015) that affected the relative level of validity and reliability. For what concern the learning progression, the current results suggested that the lessons need to be arranged by considering the following steps: 1) the characteristics of the sport disciplines (i.e., invasion vs net/wall games), 2) the impact of the gender differences, and 3) the effect of sport practice on the level of technical and tactical skills. By keep in mind the current results when considered these steps, each teacher needs to address each one of the aforementioned factors, separately, because we have estimated as there is not interaction effect between gender differences and level of sport practice on the performance indeces addressed in this study for basketball and volleyball, distinctly.

For what concern the limits of this study, the characteristics of our sample and the number of analysed matches are not enough large to extend our results worldwide, since the same research design and approach need to be proposed in future studies in order to validate, or not, the current results. Moreover, it will be need to address more in detail the level and the characteristics of demographic variables.

By keep in mind the current results and the relative limitations, interesting stimulus can be driven by the current findings for choosing the better strategy in order to design efficient teaching-learning experiences and processes and for planning authentic and ecological assessment procedure of complex learning situations as well as the assessment of sport-based skill of secondary school students.

Acknowledgments

The authors would like to thank the following colleagues for their support during the assessment sessions: Corinne Calvagna and Giorgia Parisi.

References

Arias, J.L. & Castejón, F.J. (2012). Review of the instruments most frequently employed to assess tactics in Physical Education and youth sports. *Journal of Teaching in Physical Education*, *31*, 381-391.

Betz, N. E. (1987) Use of discriminant analysis in counseling psychology research. *Journal of Counseling Psychology*, 34, 393-403

Bunker, D., & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *Bulletin of physical*

education, *18*(1), 5-8.

Butler J, Oslin J, Mitchell S, & Griffin L. (2008) The way forward for TGFU: filling the chasm between theory and practice. *Physical & Health Education Journal*, *74*(2), 6-12.

Cohen, J. (1977). *Statistical power analysis for behavioral sciences.* (Rev. ed.) New York: Academic Press.

Grehaigne, J. F., Godbout, P., & Bouthier, D. (1997). Performance assessment in team sports. *Journal of Teaching in Physical Education*, *16*(4), 500-516.

Gutiérrez, D., Fisette, J., García-López, L. M., & Contreras, O. (2014). Assessment of secondary school students' game performance related to tactical contexts. *Journal of human kinetics*, *42*(1), 223-234.

Harvey, S., & Jarrett, K. (2014). A review of the game-centred approaches to teaching and coaching literature since 2006. *Physical Education and Sport Pedagogy*, *19*(3), 278-300.

Harvey, S., Smith, M. L., Song, Y., Robertson, D., Brown, R., & Smith, L. R. (2016). Gender and school-level differences in students' moderate and vigorous physical activity levels when taught basketball through the tactical games model. *Journal of Teaching in Physical Education*, *35*(4), 349-357.

Lever, J. (1978). Sex differences in the complexity of children's play and games. *American Sociological Review*, 471-483.

Mitchell SA, Oslin JL, Griffin LL. *Teaching Sport Concepts and Skills: A Tactical Games Approach.* (3rd Ed.). Champaign, IL: Human Kinetics; 2013

Nadeau, L., Godbout, P., & Richard, J. F. (2008a). Assessment of ice hockey performance in real-game conditions. *European Journal of Sport Science*, *8*(6), 379-388.

Nadeau, L.; Godbout, P. & Richard, J. (2008b). The validity and reliability of a performance assessment procedure in ice hockey. *Physical Education and Sport Pedagogy*, *13*(1), 65-83

Oslin, J. L., Mitchell, S. A., & Griffin, L. L. (1998). The game performance assessment instrument (GPAI): Development and preliminary validation. *Journal of teaching in physical education*, *17*(2), 231-243.

Oslin, J., & Mitchell, S. (2006). Game-centered approaches to teaching physical education. *The handbook of physical education*, 627-651.

Otero-Saborido, F. M., Lluch, A. C., & Gonzalez-Jurado, J. A. (2015). Student precision and reliability of the team sport assessment in basketball: a primary education case study. *South African Journal for Research in Sport, Physical Education and Recreation*, *37*(2), 83-94.

Richard, J.F.; Godbout, P.; Tousignant, M. & Gréhaigne, J.F. (1999). The try-out of a team-sport assessment procedure in elementary and junior high school PE classes. *Journal of Teaching in Physical Education*, *18*(3), 336-356.

Sgrò, F., Quinto, A., Pignato, S., & Lipoma, M. (2016). Comparison of product and process oriented model accuracy for assessing countermovement vertical jump motor proficiency in pre-adolescents. *Journal of Physical Education and Sport*, *16*(3), 921-926.

Sgrò, F., Quinto, A., Messana, L., Pignato, S., & Lipoma, M. (2017). Assessment of gross motor developmental level in Italian primary school children. *Journal of Physical Education and Sport*, *17*(3), 1954-1959.

Thorpe R, Bunker D, Almond L. 1986. *Rethinking games teaching*. Loughborough, UK: Loughborough University

Tritschler, K. (2000). Barrow & McGee's practical measurement and assessment (5th edn). Baltimore, MD: Lippincott Williams & Wilkins