Journal of Physical Education and Sport ® (JPES), 17(2), Art 128, pp. 839 - 845, 2017
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Social network analysis applied to children: Cooperation games versus cooperation-opposition games

ANDREIA SANTOS[1], FILIPE MANUEL CLEMENTE[3,5], JUAN SANCHEZ[1], FRANCISCO CAMPOS[1,2], FRUTUOSO SILVA[4], RUI SOUSA MENDES[1,2], FERNANDO MANUEL LOURENÇO MARTINS[1,2,3].
[1]Instituto Politécnico de Coimbra, ESEC, Coimbra, PORTUGAL.
[2]Instituto Politécnico de Coimbra, IIA, Robocorp, ASSERT, PORTUGAL.
[3]Instituto de Telecomunicações, Delegação da Covilhã, PORTUGAL.
[4]University of Beira Interior, PORTUGAL
[5]Instituto Politécnico de Viana do Castelo, Escola Superior de Desporto e Lazer, Melgaço, PORTUGAL.

Published online: June 30, 2017
(Accepted for publication June 19, 2017)
DOI:10.7752/jpes.2017.02128

Abstract:
In order to study the effect of cooperative and opposition games in children interactions, 10 preschool children (5 to 6 year olds) were monitored over a 1-month period: the interactions between peers were quantified and analyzed in different games, through Social Network Analysis. Results suggest a significant correlation between a cooperative environment and a more connected and balanced passing network, less dependent on a given player, more focused on the goal at task. This research indicates that a cooperative environment can optimize and enhance the interactions between children, creating a stronger, more functional and more connected network.
Key Words*:* Children; cooperative; cooperative – opposition; interactions; games.

Introduction

Social interactions among children can play a significant role in their development, both short-term and long-term (Ladd, 2005). Social, psychological and physical skills can be influenced by peer relationships during free activities (Smyth & Anderson, 2000). These relationships are complex and dynamic, and depend on multiple constraints, such as: context (eg, home, playground, and classroom); genre; number of children in the group; individual characteristics (eg psychological and physical abilities, social environment); humor (Veiga, Ketelaar, Leng, Cachucho, Kok, Knobbe … Rieffe, 2016).

Interactions between individuals have a crucial role in the development of more sophisticated physiological functions. To examine and explain the social development of a child, the interactions between peers must be analyzed, and not only how each child behaves individually (Schaffer, 1984).

There is a general agreement on the importance of children's development of strong positive social skills. The ability to interact in positive, nonaggressive, collaborative ways with others is one of the most fundamental goals of development and provides a basis for success in friendships, marriage and careers (Bay-Hinitz, Peterson & Quilitch, 1994). However, the development of a high level of social competence can be challenging for preschool-aged children (Green & Rechis, 2006).

Positive peer oriented behaviors play an important role in forming healthy social relationships (Babcock, Hartle & Lamme, 1995); thus, it is important to investigate the ways that children's positive social behaviors are encouraged and discouraged. Children in preschool who display a wide range of positive behaviors are inclined to be liked more by their classmates than children who are aggressive. This is an important justification for the present study since the single best childhood predictor of adults' adjustment is how well a child gets along with other children (Babcock et al., 1995).

Much of the learning of these behaviors is done through play (Bruner, 1975); in effect, play is the child's workshop, a place where rules, behaviors and consequences are explored, changed and learned. Games are a central aspect of children's play (Bay-Hinitz et al, 1994). Different games (structured or free play) are very important in the emotional and cognitive development of children: they allow children to develop multiple skills, to learn rules, and to explore their reality and culture (Alves & Bianchin, 2010).

Considerable research has focused on how games influence behavior. For example, Murphy, Hutchison and Bailey (1983) found that the aggressive playground behaviors of elementary school children were reduced when free (unstructured) play was replaced by organized games (rope jumping and foot races) and a time-out procedure.

Corresponding Author: ANDREIA SANTOS, E-mail: asp.santos@hotmail.com

Games can be analyzed according to their social structure. A competitive game is one in which there are winners and losers (Kohn, 1992). Such games create strong individual motivation to succeed as well as an interest in seeing one's opponent fail.

Cooperative games and activities, however, encourage sharing, trust, inclusion and acceptance, and they seem to be a way for children to learn and practice positive social behaviors (Finlinson, Austin & Pfister, 2000). Since the goal structure of cooperative games is based on mutual interdependence, cooperative games give practice in encouraging and helping others (Bay-Hinitz et al., 1994).

Although not all studies show consistent effects, academic performance appears to improve with cooperative activities (Johnson, Maruyama, Johnson, Nelson & Skon, 1981; Madden & Slavin, 1983; Slavin, 1990). Research with preschool children has also demonstrated that the structure of play materials influences the extent to which children engage in prosocial play behaviour (Quilitch & Risley, 1973).

In fact, learning situations which require cooperative interdependence lead to more positive social interaction than do situations which elicit competition (Orlick, 1981). Likewise, games which have been designed to bring children together in a cooperative rather than a competitive way appear to promote children's positive adjustment and development in several measurable ways (Finlinson et al., 2000).

In contrast, a number of problem behaviors have been associated with competitive activities. Competitive endeavors have been associated with decreased academic performance and higher levels of aggression and hostility (Kohn, 1992). Kohn (1992) also claims that competition in all its forms erodes relationships and leads to envy, distrust and aggression.

This articles analyses and compares children's interactions in cooperative versus competitive games, and it can decisively help educators (parents, teachers, etc.) structure children's play activities, both at home and at school, since the ability to balance cooperative and competitive behaviors has important implications for a child's overall development and future success (Green & Rechis, 2006)

Material & methods

Participants

Participants were 10 children [5 boys (n=5; 5.8 ± 0.4 years of age; 117.8 ± 6.1 cm of height; 21.6 ± 4.8 kg of body mass index) and 5 girls (n=5; 5.6 ± 0.5 years of age; 116.8 ± 3.1 cm of height; 19.3 ± 2.1 kg of body mass index)].

The methodological procedures were described to the parents, which signed an informed consent regarding the study to be performed. The study followed the international guidelines and principles for research involving human subjects, in accordance with the Declaration of Helsinki.

Procedure

This research focuses on the interactions between children in both cooperative and competitive games played in Motor Expression Activity classes held at Escola Superior de Educação de Coimbra, during a month.

Data was gathered once a week, at Tuesdays, using 2 SONY Cameras and 10 Accelerometers (1 for each subject). At first, it was also registered (for each child): birth date; hand dominance; height and weight. Height (using a ADE MZ10038 stadiometer) and weight (using a SECA DELTA model 707 scale) were measured twice, to spot any possible errors. The class before the beginning of the study was used to prepare the games and to do a familiarization session, so that children got used to the games and equipment required.

Each child was numbered from 1 to 10 and the data was collected after video reviews of each class previously recorded (analysts had a previous training session on the subject).

Game Description

The selected games were performed for 5 exact minutes each. Note that the first minute was used to explain and demonstrate the game. Each child had a different colored sweater so it was easier to recognize them when analyzing the data.

Cooperation Games:

"Hug me": Children should run freely (in a delimited area), and as soon as the teacher beeps, they should stop running and hug a classmate. The choice of the colleague to embrace is at the discretion of each child, being random or not. The activity will be performed with a group of 5 elements and with a group of 10 elements. "Don't let it fall": Children should be in a circle (this circle will be taped on the floor, since young children have little to none notion of space) throughout the game, playing with a rubber ball: they should keep it in the air, not letting it fall, cooperating/working with each other. Whenever a child receives the ball, he/she must grab it and pass it over a classmate, randomly, and switch positions with that classmate. The game ends after 5 minutes, and it is important that all children have had contact with the ball more than once, encouraging cooperation and teamwork. The activity will be performed with a group of 5 elements and with a group of 10 elements. "The more gifts the better": Each child will have a different colored sweater matching a specific card color (called a gift). There are 30 cards of each color (considering 10 different colors, 1 matching each child's sweater, there are a total of 300 cards), and they will all be set outside the delimited game area, in a specific hoop. Each child will

have his own spot (represented by a colored hoop), where the cards should be delivered. The main goal of the game is to put the maximum number of cards in other classmates hoops (not your own). Note that each child can carry only 1 card at a time.

Opposition (competitive) Games:

"Ball possession": Team A (with 3 elements in games involving 5 children and with 5 elements in games involving 10 children) will start with ball possession, having to make 10 passes in a row. If team B (with 2 elements in games involving 5 children and with 5 elements in games involving 10 children) is able to get the ball from team A, the game "resets", team B will have ball possession and it will also have to make 10 passes in a row. Note that all interceptions can only be made by hand. "Monkey in the middle": In order to set the game area, a circle is taped on the ground: team A is set outside the circle and team B is set inside the circle. Team A elements (with 3 elements in games involving 5 children and with 5 elements in games involving 10 children) will start with ball possession, having to make passes between them. If an element from team B is able to intercept the ball from an element from team A, they must switch positions. "Easy Goal": Team A (with 3 elements in games involving 5 children and with 5 elements in games involving 10 children) and team B should be in a delimited area. Each team should have a goalkeeper, with total freedom of movement. Team A's goalkeeper will have a ball and will start the game. The main objective of the game is to score the most goals in the opposing goal. It the ball hits the floor it should be collected by the "referee" and handover to the closest player. Note that there are some specific rules:

- A child in possession of the ball can't move;
- Players can pass the ball using their hands or feet;
- Players can't score using their feet (only hands allowed).

"Free Game" (cooperation and opposition): In this game, children will have a sponge ball and they will be able to play freely with it, without having any rules or guidelines (besides having to play in a delimited area). All children must be involved in the activity. This activity will be performed with a group of 5 elements and with a group of 10 elements.

Network analysis

We recorded in weighted adjacency matrices the interactions between colleagues, codified as number of passes. In this study weighted graphs and weighted digraphs were classified. The network measurements have been processed with the Social Network Visualizer (SocNetV, version 1.9.) that is a software that allow to visualize the graphs and compute the network measurements (Kalamaras, 2014; Clemente, Martins & Oliveira, 2016). Proximity prestige was used to check how close are all the other teammates to a specific player. The prominence level of each child were tested with closeness (quantifies the proximity of how close is such player to its peers), betweenness (quantifies how often each player lies between other nodes of the network) and centroid (the probability of a player to be functionally capable of organizing clusters in the team) centralities. The games "Monkey in the middle", "Easy goal", "Ball possession", "Pass and move", "The presents" and free games are analysed with weighted digraph formulas. The game "Hugh me" is the only one who use weighted graph formulas to be analysed.

Standardized Closeness Centrality

Definition 1. (Opsahl, Agneessens & Skvoretz, 2010; Clemente, Martins & Mendes, 2016) *Given two vertices* n_i *and* n_j *of the weighted graph G with n vertices. The geodesic distance between* n_i *and* n_j *is obtained by*

$$d^w(n_i,n_j) = \min_{ijh}\left(\frac{1}{a_{ih}}+\ldots+\frac{1}{a_{hj}}\right),$$

where h are intermediary vertices on paths between vertices n_i *and* n_j*, and* a_{uv} *are the elements of the weighted adjacency matrix of the G.*

Remark: *The geodesic distance between* n_i *and* n_j *in weighted digraphs is determined in the similar form that weighted graphs.*

Definition 2. (Opsahl et al., 2010; Clemente et al., 2016) *Given a weighted graph G with n vertices. The closeness index of the* n_i*,* $C_C^w(n_i)$ *is determined by*

$$C_C^w(n_i) = \left[\sum_{\substack{j=1 \\ i\neq j}}^{n} d^w(n_i,n_j)\right]^{-1},$$

where $d^w(n_i,n_j)$ *is a geodesic distance between* n_i *and* n_j*.*

Remark: *The closeness of one vertex* n_i *of weighted digraph is determined in the similar form that weighted graph.*

Definition 3. (Rubinov & Sporns, 2010; Opsahl et al., 2010; Clemente, et al., 2016) *Given a weighted graph G with n vertices. The standardized closeness index of the vertex* n_i *is obtained by*

$$C'^{w}_{(C)}(n_i) = (n-1) \times \left[\sum_{\substack{j=1 \\ i \neq j}}^{n} d^{w}(n_i, n_j) \right]^{-1},$$

where $d^{w}(n_i, n_j)$ *is a geodesic distance between* n_i *and* n_j.

Remark: *The standardized closeness of one vertex* n_i *of weighted digraph is determined in the similar form that weighted graph.*

Standardized Betweenness centrality

Definition 4. (Rubinov & Sporns, 2010; Clemente et al., 2016)

Given an unweighted graph $G = (V, E)$, *with* $n_i, n_j, n_k \in V$, $i, j, k = 1, \ldots, n$. *The standardized betweeness centrality index is calculated by*:

$$C'_b(n_k) = \frac{1}{(n-1)(n-2)} \sum_{\substack{n_i, n_j \in V \\ i \neq nj \neq k}} \frac{g_{ij}(n_k)}{g_{ij}},$$

where $g_{ij}(n_k)$ is the number of shortest paths between n_i and n_j that pass trought n_k and g_{ij} is the number of shortest paths between n_i and n_j.

Remark: The betweenness centrality and standardized betweeness centrality in weighted and/or direct graphs, is determined the similar form that unweighted graphs shut that the path lengths are obtained on respective weighted or direct paths (Rubinov & Sporns, 2010; Clemente et al., 2016).

Proximity Prestige

Definition 5. (Schramm, 2012; Clemente et al., 2016)

Let n_i *be a vertex of unweighted digraph G with n vertices. The proximity prestige index,*  , *of the vertex* n_i, *is the proportion of vertices who can reach* n_i *to the average distance these vertices are from* n_i, *and is determined by*

where I_i *is the number the vertices that are either directly or indirectly connected to* n_i *and* $d(n_j, n_i)$ *is the shortest path between vertices* n_i *and* n_j.

Remark: *In weighted digraph the proximity prestige index is determined the similar form that unweighted digraphs, considering* $d^{w}(n_j, n_i)$.

Centroid centrality

Definition 6. (Scardoni & Laudanna 2012; Clemente et al., 2016)

Given one G *unweighted graph with n vertices. The centroid centrality index* $C_{Ce}(n_i)$, *of a vertex* n_i *is determined by*

$$C_{Ce}(n_i) = min\{f(n_i, n_j) : n_j \in V - \{n_i\}\}$$

where $f(n_i, n_j) = \gamma_{n_i}(n_j) - \gamma_{n_j}(n_i)$, *and* $\gamma_{n_i}(n_j)$ *is the number of vertex closer to* n_i *than to* n_j, *i.e.* $\gamma_{n_i}(n_j) = |\{n_k \in V : d(n_i, n_k) < d(n_j, n_k)\}|$

Remark: (Scardoni & Laudanna 2012; Clemente et al., 2016)

The centroid centrality index is applied the similar weighted graphs and weighted digraphs.

Statistical Procedures

The type of game was defined as factor for the analysis of differences between Cooperation and Opposition. Betweenness and closeness centralities, centroid centrality in the weighted graph and digraph situations,

Proximity prestige in the weighted digraph situation were the dependent variables. Independent-samples t-test was applied to compare the proximity prestige, betweenness and closeness centralities scores for Cooperation and Opposition. Preliminary analysis was performed to ensure no violation of the assumptions of normality and Levene's test for equality of variances (Pallant, 2011). The effect size (ES) to independent t-test, Cohen's d was executed as ES measure using the follow criteria (Cohen, 1988): small effect ($d \leq 0.2$); moderate effect ($0.2 < d \leq 0.8$); and large effect ($d > 0.8$).

Mann-Whitney Test was applied to compare the Centroid centrality values for Cooperation and Opposition. For the case of non-parametric tests is obtained (Pallant, 2011): $\frac{|z|}{\sqrt{N}}$ where N is the total sample and the value of z that is reported after apply the Mann-Whitney test. The classification of effect size is obtained by using of the follow criteria (Pallant, 2011): very small ($r < 0.1$); small effect ($0.1 \leq r < 0.3$); medium effect ($0.3 \leq r < 0.5$); and large effect ($r \geq 0.5$).

SPSS software (version 24.0, Chicago, Illinois, USA) was used to compute the statistical procedures. A statistical significance of 5% was defined.

Results

The comparison of closeness scores between cooperation (M= 0,424; SD=0,266) and opposition (M=0.317 and SD=0,304) showed significant statistical differences (t(158)=2,384, p-value= 0.018, ES=0.377, moderate effect size).

The comparison of betweenness scores between cooperation (M= 0,1203; SD=0.174) and opposition (M=0,1022 and SD=0,126) showed no significant statistical differences (t(158)=0,753, p-value= 0,453, ES=0,119, small effect size).

The comparison of proximity prestige scores between cooperation (M= 0.360; SD=0.167) and opposition (M=0.292 and SD=0.212) showed significant statistical differences (t(137.675)=2.115, p-value= 0.036, ES=0.349, moderate effect size).

For the case of the comparison of centroid centrality values between cooperation (Md=-3) and opposition (Md= -2) showed significant statistical differences (MW= 2902.5, z=-1.030, p-value= 0.303, ES= 0.062, very small effect size).

Discussion

This study aimed to explore and compare the interactions between young children in a passing network in different environments: cooperative games versus competitive (non-cooperative) games. The findings may provide insights on how educators should structure children's play time, both at home and at school, considering a balanced approach and the importance of difference games in the overall children development. In fact, the social network analysis and their metrics can help new approaches for the study of teammates' interactions (Clemente, Martins; Kalamaras, Oliveira, Oliveira & Mendes, 2015).

It is suggested that cooperative games optimize the interactions between children: results suggested higher intra-team well-connected passing relations in cooperative games (M=0,424) compared to competitive games (M=0,317), associated with higher closeness scores.

A player with higher betweenness scores is crucial to maintain team passing connections by acting as a connecting bridge (Freeman, 1978). Although the comparison of betweenness scores between cooperation and competitive/opposition games showed no significant statistical differences, both scores were relatively low and spread across different players, showing a well-balanced passing strategy (with a high ability to maintain the ball flow) and lower team passing dependency for a given player, in line with the available literature (Gonçalves, Coutinho, Santos, Lago-Penas, Jiménez & Sampaio, 2017).

In a cooperative game scenario, children seem to extend both its choice of moves as well as the recurrence of the interactions that they engage with.

Also, results suggest higher proximity prestige scores in cooperative games (M=0,360). This value being close to the closeness centrality score indicate a strongly connected network, clearly focused on the goal at task (Hanneman & Riddle, 2005).

This research also shows a higher average centroid value in cooperative games (versus competitive games), indicating that this network is more likely organizing functional units, whereas a pass network with a very low average centroid value would behave more likely as an open cluster of players connecting different regulatory clusters, as referred by Clemente, Martins and Mendes (2016).

This study provides support for the potential impact of different game types on the level of the interactions between children. It suggests, as would be expected, that many of the cooperative characteristics/attributes stated before: stronger connection, team play, less dependency on the effort of a few players, focus on the goal at task, emerge in cooperative type games.

Further studies on this topic can extend the research by addressing different variables: the present approach could also be applied to a wide range of contextual variables, such as: game type/status, different ages across team players, space, encouragement, etc... These different contexts may afford different collective behaviors

understanding which, in turn, could enrich development programs/tools available to educators while structuring children's playing activities.
However, some limitations of the present study must be considered: small sample size, children's age (resulting in different perceptions of the tasks to be performed and possibly different motor development stages across team players), game types used (some games can be able to express more of a cooperative/competitive behavior than others; some rules can be restrictive).

Conclusions

In summary, this study provided evidence that the structure/environment of the games children play can highly change the interactions between them during each game. In fact, this research indicates that a cooperative environment can optimize and enhance the interactions between children, creating a stronger, more functional and more connected network, with higher intra-team passing relations, less dependent on a given player. The overall group's outcome is related with the interdependence from teammates and the way they dynamically adapt to the task.
Also, the social network analysis allowed to reveal key determinants of child interactions, that can be used to optimize their future development.
In future research, it would be helpful to explore different variables/key determinants that might maximize the aforementioned interactions.

Acknowledgments

This study was carried out within the scope of R&D Unit 50008, financed by UID/EEA/50008/2013 and by QREN, Mais Centro - Programa Operacional Regional do Centro, FEDER (CENTRO-07-CT62-FEDER-005012; ID: 64765). This study was conducted in the aim of the granted project: uPATO from Instituto de Telecomunicações. We would like to also thank to Frutuoso Silva and Quoc Trong Nguyen for their contribution during the data processing.

References

Alves, L., & Bianchin, M. (2010). *O jogo como recurso de aprendizagem*. Revista Psicopedagogia, *27*(83), 282-287.

Ames, C. (1981). *Competitive versus cooperative reward structures: The influence of individual and group performance factors on achievement attributions and affect.* American Educational Research Journal, 18, 273-287.

Babcock, F., Hartle, L., & Lamme, L. (1995). Prosocial Behaviors of Five-Year-Old Children in Sixteen Learning/Activity Centers. *Journal of Research in Childhood Education, 9(2), 113-127.*

Bay-Hinitz, K., Peterson, F., & Quilitch, R. (1994). *Cooperative games: a way to modify aggressive and cooperative behaviors in young children*. Journal of Applied Behavior Analysis, 27(3), 435–446.

Bruner, J. (1975). *From communication to language: A psychological perspective*. Cognition, 3, 255–287.

Clemente, F., Martins, F., Kalamaras, D., Oliveira, J., Oliveira, P., & Mendes, R. (2015). *The Social Network Analysis of Switzerland Football Team on Fifa World Cup 2014*. Journal of Physical Education and Sport. Vol. 15, No. 1.

Clemente, F., Martins, F., & Mendes, R. (2016). *Social network analysis applied to team sports analysis*. Netherlands: Springer International Publishing.

Cohen J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Finlinson, A., Austin, A., & Pfister, R. (2000). *Cooperative Games and Children's Positive Behaviors.* Early Child Development and Care Journal, 164(1), 29-40.

Freeman, C. (1978). *Centrality in Social Networks Conceptual Clarification*. Social Networks 1(3): 215-39.

Gonçalves, B., Coutinho, D., Santos, S., Lago-Penas, C., Jiménez, S. & Sampaio, J. (2017). *Exploring Team Passing Networks and Player Movement Dynamics in Youth Association Football*. PLoS ONE 12(1): e0171156.

Green, V. & Rechis, R. (2006). *Children's cooperative and competitive interactions in limited resource situations: a literature review*. Journal of Applied Developmental Psychology. Vol. 27 (pp. 42-59).

Hanneman, R., & Riddle, M. (2005). *Introduction to social network methods*. Riverside, CA: University of California, Riverside.

Johnson, D., Maruyama, G., Johnson, R., Nelson, D., & Skon, L. (1981). *Effects of cooperative, competitive, and individualistic goal structures on achievement: A meta-analysis.* Psychological Bulletin, 89, 47-62.

Kohn, A. (1992). *No contest: the case against competition* (rev. ed.), Boston: Houghton Mifflin.

Ladd, G. (2005). *Children's Peer Relations and Social Competence: A Century of Progress.* Yale University Press.

Madden, N., & Slavin, R. (1983). *Mainstreaming Students with Mild Handicaps: Academic and Social Outcomes.* Review of Educational Research, 53, 519-569.

Murphy, H., Hutchison, J., & Bailey, J. (1983). *Behavioral school psychology goes outdoors: the effect of organized games on playground aggression*. Journal of Applied Behavior Analysis, 16(1), 29–35.
Opsahl, T., Agneessens, F., & Skvoretz, J. (2010). *Node Centrality in Weighted Networks: Generalizing Degree and Shortest Paths*. Social Networks, 32(3), 245-251.
Orlick, T. (1981). *Cooperative play socialization among preschool children*. Journal of individual psychology, Chicago, III.
Orlick, D., McNally, J., & O'Hara, T. (1978). *Cooperative Games: Systematic analysis and cooperative impact.* In F. Smoll & R. Smith (Eds.), Psychological perspectives in youth sports (pp. 203-225). Washington, DC: Hemisphere.
Pallant, J. (2011). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using 619 the SPSS Program*. Australia: Allen & Unwin.
Quilitch, R., & Risley, R. (1973). *The effects of play materials on social play.* Journal of Applied Behavior Analysis, 6, 573-578.
Rubinov, M., & Sporns, O. (2010). *Complex network measures of brain connectivity: uses and interpretations*. NeuroImage, 52(3), 1059-1069.
Scardoni, G., & Laudanna, C. (2012). *Centralities based analysis of complex networks.* INTECH Open Access Publisher.
Schaffer, H.R. (1984). *The Childs Entry into a Social W*orld. London: Academic Press Inc.
Schramm, H. J. (2012). *Freight forwarder's intermediary role in multimodal transport chains: A social network approach.* Vienna, Austria: Springer.
Slavin, R. (1990). *Cooperative learning: Theory, research and practice.* Englewood Cliffs, NJ: Prentice-Hall.
Smyth, M., & Anderson, I. (2000), *Coping with clumsiness in the school playground: Social and physical play in children with coordination impairments*. British Journal of Developmental Psychology, 18, 389–413.
Veiga, G., Cachucho, R., Neto, C., & Rieffe, C. (2015). *Inovações no estudo do comportamento das crianças com sensores de proximidade*. In Lopes, V., & Gonçalves, C. (Eds.). *Estudos em desenvolvimento motor da criança* VIII (pp. 44-59). Bragança: ESE-IPB/CIDESD.
Veiga, G., Ketelaar, L, de Leng, W., Cachucho, R., Kok, J. N., Knobbe, A., Neto, C., & Rieffe, R. (2016). *Alone at the playground*. European Journal of Developmental Psychology.
Dirty Dozen (DTDD-J). *Japanese Jo*