BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 2–3; ISSN 2351-6496 / eISSN 2538-8347

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Page 2 should include the **abstract** (250 words) revealing the scientific problem and providing the major data of the research. It must be structured into the following sections: Background. Methods. Results. Conclusion. Keywords (from 3 to 5 informative words and/or phrases).

The full text of the manuscript should begin on page 3. It should be structured as follows:

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Acknowledgements. On the Acknowledgement Page the authors are required to state all funding sources, and the names of companies, manufacturers, or outside organizations providing technical or equipment support (in case such support had been provided).

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All abbreviations should be explained in parentheses what they stand for on their first occurrence in the text. Non-standard special abbreviations and symbols need only to be defined at first mention. The results of all measurements and symbols for all physical units should be those of the System International (SI) Units. In the text of the article all numbers up to ten are to be written in words and all numbers starting from eleven on – in Arabic figures.

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Chapter in a book:

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 4–12; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.773

CONCEPTUAL MODEL OF THE EDUCATIONAL PRESUMPTIONS OF THE COORDINATION OF COLLABORATION AND COMPETITION CAPABILITIES IN DANCESPORT

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ABSTRACT

Background. Simultaneously manifested collaboration and competition capabilities are coordinated. This harmony is determined by social interdependency of participants of the activity. It is also true about the dancesport activity. Dancesport dancers mostly compete for higher results, but collaboration is obligatory in order to achieve that result. The problem question was what the educational presumptions of the coordination of collaboration and competition in the dancesport activity are. *The research aim* was to create the conceptual model of the educational presumptions of the coordination of collaboration and competition in the dancesport activity.

Research method was theoretical analysis and synthesis. The results of theoretical analysis are generalized and incorporated into the conceptual model.

Discussion and conclusions. The theoretical model of the educational presumptions of the coordination of collaboration and competition in dancesport compiled and presented on the basis of the analysis of scientific literature reveals the conceptual basis of the educational presumptions of the coordination of collaboration and competition in dancesport. Dancesport dancers act and strive for sport and personal goals by using collaboration and competition capabilities, coordinating them and reaching the higher form of coopetition (harmony). The model of the educational presumptions of the coordination of collaboration and competition in dancesport is based on the analysis of literature about the forms of the interpersonal interaction both in the social environment and sport activity, manifestation of discussed forms of the interaction and theory of empiric learning including capabilities.

Keywords: collaboration, competition, coopetition, dancesport.

INTRODUCTION

Relevance of the problem. The collaboration and competition capabilities are related to marginal elements of social relations and they must be coordinated if they are manifested simultaneously. According to Matzdorf and Sen (2015), such interactions as competition, collaboration, negotiations and team work are obligatory for the performance of dance in dancesport. Cerny and Mannova (2011) also state that collaboration and competition are two marginal elements of social relations and they must be coordinated if they act simultaneously. It accentuates and confirms the complicacy of these two social capabilities and their necessity on striving for the harmony of capabilities in dancesport.

Thus, proper coordination of collaboration and competition enables getting a better result. The content of the above-mentioned interactions consists of social capabilities – result of the social and educational interaction. As different social capabilities can be obtained when doing sports (Šniras & Malinauskas, 2014), it can be supposed that the social capabilities obtained in the sport activity can be transposed to other fields of life and encourage the development of a harmonious personality. It substantiates the significance of

the research of the coordination of collaboration and competition capabilities on the basis of the dancesport activity.

The problem question was what the educational presumptions of the coordination of collaboration and competition capabilities in the dancesport activity are.

Accordingly, the **research aim** was to reveal the conceptual model of the educational presumptions of the coordination of collaboration and competition capabilities.

METHODS

Endeavouring to achieve the aim of the article, theoretical analysis and synthesis was provided: scientific insights into the theory of Social Interdependence were analysed, interrelation between collaboration and competition revealed, afterwards, the theoretical implications on collaboration and competition collaboration were provided. Consequently, the obtained results of theoretical analysis were generalized and incorporated into the conceptual model. The educational presumptions of the coordination of collaboration and competition capabilities were emphasized.

RESULTS

Collaboration and competition capabilities in the sport activity. Schottle, Haghsheno, and Gehbauer (2014) provided the definition of "collaboration" and indicated the collaboration is organizational relations for common goals in the execution of the common organized activity based on the mutual trust and joint forces on solving arising problems together. It is participation in a planned process with distributed duties, risk and remuneration among its participants. This kind of definition can be adapted in the sport activity involving all signs of a professional activity with the most important goal – to win, be leader in the sport or its group.

The research performed by Arends (1998) confirms that three tendencies can be noticed in the collaboration: there are interdependent relations; members become friends for the common activity in the group; acting together, the collaboration is especially effective – it encourages creating ideas and affecting each other to a wider extent.

Appley and Winder (1977) defined collaboration as a system of human relations with the following values: individuals have a common goal and common limits of acting in the group; the interaction among individuals is based on honesty and justice; the above-mentioned goals are defined by awareness of motives of each individual, understanding of each other and commitment to act together for the committed thing or reached goal. It can be supposed these tendencies of collaboration are characteristic to the sport activity.

Analysing the manifestation of leadership capabilities in the sport activity, Extejt and Smith (2009) defined collaboration as team work – effective work with teams or their influence beyond the team: striving for organizational purposes; acts related with the regard of needs of other people and mutual assistance; unification and observation of agreements; coordination of personal goals with goals of the organization or team. In team sport, the collaboration can cause a special physical and positive emotional state when the internal needs are satisfied fully. Xiong (2012) indicates that the coordination of technique and tactics as well as its result in the sport activity usually depend on the psychological preparation of sportspeople to collaborate. They treat the collaboration in the sport activity as a psychological feature of the coordination of intentions that also affects the concentration in the team.

Mattessich and Monsey (1992) defined cooperation as informal relations that are not based on a common mission or planned efforts. Meanwhile, collaboration interconnects into a common structure with the obligation to reach the common goal. Thomson and Perry (2006) note the collaboration grants a higher level of collective acts than cooperation. Meanwhile, Denise (1999) noticed that cooperation is the strategy of attainment of the competitive advantage. Polenske (2004) accentuates higher interdependency between cooperation and competition and states that cooperation and collaboration can almost be identical in certain cases. Some scientific studies explain the differences between cooperation and collaboration by using the dimensions of uninterruptable integration, commitment and complicacy. They relate collaboration with a high level of integration, commitment and complicacy and cooperation – with a low level of integration, commitment and complicacy (Mattessich & Monsey, 1992; Thomson & Perry, 2006).

Schottle, Haghsheno and Gehbauer (2014) interconnect collaboration, cooperation and competition into a certain communication system together with coordination, conflicts, commu-

nication, management, commitment, agreement and compromise. The authors of the system explain cooperation and collaboration as an interaction among participants and coordination – as a constituent of cooperation and collaboration and not an independent relation. Kadefors (2004) indicates that cooperation is closely related with management and collaboration – with trust. Activity participants have closer and stronger relations in the collaboration because their common goal and commonly performed activity are based on the trust and openness.

A concrete sport activity can be defined as an organized activity when two or more individuals or teams compete for an award observing certain rules (Chick, 1984). Competition can be one of external social factors and it can have both the positive and negative influence on motivation. Competing sportspeople compare their capabilities and possibilities with their rival in the same sport activity.

Deci and Olson (1989) determined that competition can be interacting (in the defence and offence). In the sport activity, competition is manifested as a victory (one party wins and the other one must lose a victory). In the case of this competition, awards (money, prizes or points) are distributed among participants unevenly, taking into account the results of their performance (for example, the sportsperson that wins the first position gets more points than that taking a lower position).

The mentioned theoretical provisions enable drawing a conclusion that collaboration and competition capabilities are obligatory in the sport activity. Moreover, there is a relation between sport and social capabilities. A sportsperson often becomes activity object and subject in the sport activity: according to his/her capabilities, the sportsperson must solve various issues related with the force, endurance or physical ability as well as tactic tasks, make decisions, collaborate and compete in order to reach sport goals.

Empirical learning as model of the educational presumptions in the dancesport activity. Galanis, Mayol, Forment, and García-Peñalvo (2015) indicate that the interaction among people is very important for informal learning. The sport activity is inseparable from the interaction among people. Informal learning is related with the activity and experience very closely. It is also significant in the context of the sport activity on analysing the empiric learning as basis of the educational presumptions.

Empiric learning is based on three presumptions (Smith, 1980): people learn best when they are involved in empiric learning personally; an individual masters (learns) the knowledge when it is important for the individual or changes the individual's behaviour; a person has the biggest incentives to learn when the person chooses the goals of learning freely and is inclined to strive for them systematically.

The conclusions of the research performed by Harun and Salamuddin (2014) confirmed that empiric learning during the physical activity is basis of the development of social capabilities. The works of other scientists (Del Val Núñez, Romero, Sánchez, & Aránega, 2018; Muñoz Campos, 2017) also confirm the development of social capabilities during empiric learning. Moreover, Dewey (1938) stated experience is very important for the development of capabilities and acceleration of socialization processes.

De Carteret (2008) indicates that empiric learning takes place during the application of social capabilities, i.e., in the practice, conversations, on taking responsibility or in the cooperation. Cullen, Batterbury, Foresti, Lyons, and Stern (2000) published the conclusions of the research that empiric learning can help to raise the self-confidence of individuals and improve their social capabilities. Madrona et al. (2014) confirmed social capabilities are also developed during the trainings that meet the conception of empiric learning. This research allows stating that empiric learning is a suitable form of education for the development of social capabilities.

To sum up, it can be presumed that the sport activity is closely related with empiric learning and social capabilities can be developed in it. The basis of the educational interaction of empiric learning is learning by means of experience (during the sport activity). The condition of this kind of learning in the context of empiric learning is circumstances of the activity that all together can be considered educational presumptions and the activity itself becomes education.

Coordination of collaboration and competition capabilities in the dancesport activity. Collaboration and competition were considered incompatible in the theory of educational science for a long time, but it has been stated recently (Bennett & Kottasz, 2011; Muijs & Rumyantseva, 2014) that collaboration is manifested in the environment of learning, which competition is also characteristic

to. Clarke-Hill, Li, and Davies (2003) indicate that collaboration between partners is an undoubtedly important organizational way of learning.

Collaboration is not always successful. Schottle, Haghsheno and Gehbauer (2014) revealed that collaboration among partners is mostly affected by trust, communication, commitment, openness, sharing the knowledge and information, agreements and determination to risk. Malcolm (2014) noted the benefits of collaboration and competition in sport are related.

Competition in sport is a factor of the encouragement of sport mastery. Ainscow, Muijs, and West (2006) suggest that collaboration is possible and increases when competing. The duality of competition and collaboration is used for the explanation of this phenomenon and the term "coopetition" is used to name the phenomenon itself; it is described with interorganizational relations when one part of relations is determined by competition and the other one – by collaboration (Brandenburger & Nalebuff, 1996). In this case, the advantages of competition are manifested in collaboration and coopetition means the coordination of collaboration and competition capabilities.

Xiong (2012) confirmed that every sportsperson of team sports only focuses on the own personality on striving for sport goals and performing set tasks (he/she tries to reveal (represent) (position) the own personality and ignores collaboration). These results of the research are important because they enable stating that sportspeople compete for their personal goals even if they collaborate in a team. Thus, it is necessary for a sportsperson to coordinate collaboration and competition.

Attle and Baker (2007) emphasize that both competition and collaboration have a potential effect on a learner's behaviour. Moreover, there is an insight that these opposite kinds of behaviour should be coordinated. In turn, collaboration and competition among individuals ensure a successful activity, so the success of individuals becomes useful for the total team (Cerny & Mannova, 2001). The authors draw a conclusion that a couple of dancers as a sport team has analogical characteristics: successful performances are only possible on participating of the most capable rivals, collaborating (cooperating) in a team, participating in matches and using the own potential to win.

Cooperation can be reached if the participants of relations act separately according to their tasks and contribute to the common result with their activity; meanwhile, collaboration should be understood as a direct interpersonal interaction, common acting together, negotiations, discussions as well as coordination of different future plans. According to the conception of cooperation by Zineldin (2004), it can be envisaged that collaboration involves cooperation and coordination. It emerges that collaboration is possible among individuals in one group (for example, in a couple of dancers) in order to reach personal goals of these individuals and those of the team (couple). Meanwhile, cooperation takes place between two or among more separate individuals (not belonging to one group (team)) or groups (teams) striving for their personal specific and common goals.

Thomson and Perry (2006) prove that cooperation for the sake of the common goal leads to collaboration. Accordingly, collaboration is defined as an activity during that independent people interact and overcome known and unknown difficulties and they together create the rules of their relations as well as structures and ways how to behave or solve the problems determining the common activity.

D. W. Johnson, R. T. Johnson, and Tjosvold (2012) believe that negative interdependency of people conditions the interaction of opposition or competition. It can be manifested as efforts to preclude a rival from reaching the goal or prevent him/her from striving for results, hiding of resources and information from each other, behaviour of mistrust and jealousy. Coakley (1997) defines competition as a social process that is ended with a victory after comparing results in the same activities or performing the same tasks.

The coordination of collaboration and competition capabilities as an interaction of dancesport dancers is manifested at two levels: inside a group (level of a couple of dancers) and among groups or couples (level of the community). Second, the social interdependency of dancers is conditioned by the structure of strived goals: individual, group (of a couple of dancers), communal (of the sport community) ones. Third, depending on the forms of the interrelation among dancers in the sport activity, the social interdependency depends on certain forms of their interaction: collaboration and competition. Moreover, there is a possible combination of the both forms of the interaction. Taking into account this fact, it can be concluded that the relation between collaboration and competition can be manifested simultaneously by coopetition as a higher form of interdependency.

Theoretical model of the educational presumptions of the coordination of collaboration and competition capabilities in dancesport. The theoretical model of the educational presumptions of the coordination of collaboration and competition capabilities in dancesport is constructed on the basis of the theory of social interdependency. It was determined in this work that collaboration and competition capabilities are manifested in dancesport together and simultaneously and the harmony of these capabilities is characteristic of this kind of manifestation. When at least two individuals interact, there is a certain interrelation between them. The type of this relation depends on the situation the individuals interact in (Holmes, 2002). In our work, in the case of dancesport, these relations are also circumstances of the activity as well as educational presumptions.

The pioneer of the theory of social interdependency Deutsch (1949) determined two types of interdependency: positive and negative ones. According to D. W. Johnson and R. T. Johnson (2009), positive interdependency means that people, who strive for their goal, have a positive attitude: they understand that it is only possible to reach the goal if the other individuals they are related in collaboration relations with will reach their goals, too. In the dancesport activity, positive interdependency among dancers is determined by successful common work in a team (couple of dancers) and competition against rivals in matches on striving for the leadership (recognition). Positive interdependency is encouraged by the interpersonal interaction.

According to Choi, D. W. Johnson and R. T. Johnson (2011), positive interdependency is inseparable from collaboration in the community. Negative interdependency means a negative interpersonal relation among people striving for their goals: the individuals understand that they can only strive for their goals if the other individuals they are related in competition relations with will stumble and not reach for their goals (D. W. Johnson & R. T. Johnson, 2009). Negative interdependency is also characteristic to the match interaction. Choi, D. W., Johnson and R. T. Johnson (2011) think that negative interdependency is manifested under the conditions of competition.

Enjolras and Waldahl (2007) believe that in order to keep interrelations in sport, they must be useful. D. W. Johnson and R. T. Johnson (2005) suggest that it is insufficient to understand positive or negative interdependency. People must make sure of it in reality on striving for their goal with certain acts. These acts are useful under the circumstances of collaboration (encouraging acts) or under the circumstances of competition (a rival's acts are inhibited). Thus, dancesport dancers that support each other in a couple and work together strive for international recognition and leadership in global ratings and try to overcome their rivals.

The performed analysis of scientific literature enables envisaging the educational presumptions of the coordination of collaboration and competition capabilities in dancesport manifested as coopetition. First, the dancesport activity by itself is an educational activity in a sense of empiric learning. Second, the circumstances of the dancesport activity are educational conditions identified with educational presumptions in this work. Thus, the circumstances of the activity that are significant for the coordination of collaboration and competition capabilities must be accentuated in the dancesport activity.

Essential characteristics of dancesport: sport and competitive ones. The essential criterion of the assessment of dancesport is aesthetics (Soraka, 2007) and it is related with feelings and experiences. Of course, not all the circumstances of the dancesport activity are significant for the coordination of collaboration and competition capabilities in dancesport. The effect on the coordination of collaboration and competition capabilities of dancers is only determined by certain circumstances of the activity and they must be revealed. It was indicated that the basis of collaboration and competition is a social concept. In turn, the major part of the social interaction is based on an individual's communication that is determined by communication capabilities. It allows drawing a conclusion that collaboration and competition capabilities are closely related with interpersonal interaction and communication capabilities. The interpersonal interaction is both exchanging of information in a non-verbal form that can change the partner's behaviour and organization of common acts. Thus, the interpersonal interaction is closely related with collaboration and cooperation. Moreover, this interaction can change the partner's behaviour in a non-verbal form, too, because it is closely related with competition and strategy of strived goals. Besides, social relations are emphasized in the structure of the interpersonal interaction: spatial contacts, psychological contacts, social contacts and social relations. They also affect collaboration and competition capabilities and coordination of these capabilities.

The performed analysis of scientific literature confirmed that goals are essential objects of the interpersonal interaction. Sportspeople's goals and their structure condition the peculiarities of the interpersonal interaction among sportspeople: they condition competition and collaboration; sportspeople encounter different types of relations and these relations are even inspired by opposite goals. As a result of these relations, collaboration and competition capabilities must be coordinated. In the case of dancesport, the goals of a couple of dancers are accentuated in the structure of goals next to the personal goals of sportspeople. Thus, sportspeople can have different interactions in the sport activity: in a group (couple of dancers) and among groups (couples of dancers); moreover, when dancers interact, they can strive for individual, group and communal goals. In turn, the interactions of dancers in the dance activity are conditioned by sport and other goals and their synthesis is an obligatory condition to reach desired results.

To sum up the results of this work, the following obligatory educational conditions of the coordination of collaboration and competition capabilities in dancesport manifested as coopetition can be indicated: interpersonal interaction, presence of the community, team work in a couple, expressive creative activity (improvisation in dancing and choreography and creativity in dance halls encourage special collaboration and provide with experience of collaboration), competition, friendly and benevolent environment, common work in dance halls, striving for sport goals (personal, pair and/or communal ones), collaboration in a couple, responsibility, commonness, coordination of mutual decisions and acts, simultaneous collaboration and competition.

The accentuated educational conditions as presumptions can be interconnected by providing the theoretical model of the educational presumptions of the coordination of collaboration and competition capabilities based on social interdependency (see Figure).

The following groups of the educational presumptions of the coordination of collaboration and competition were accentuated in the compiled model on the basis of theoretical insights: independent educational conditions defined by the following interactions – relations (they determine coopetition in competition, matches, cooperation, achievements, trust and collaboration): personal goals of dancers; relations inside the club; relations beyond the club; dependent educational conditions defined by the following interactions – relations (they determine coopetition directly or each through other including trust): achievements, matches, trust, competition, cooperation, collaboration.

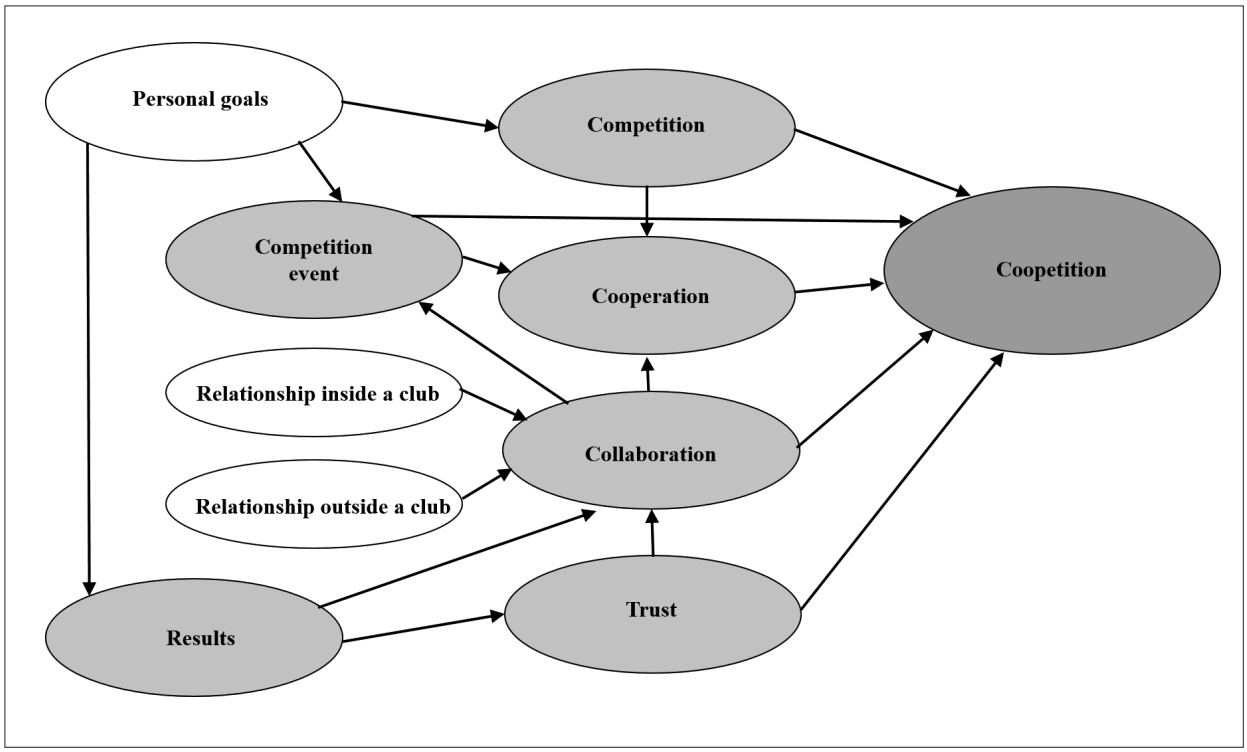

Figure. **Theoretical model of the educational presumptions of the coordination of collaboration and competition (Armas, 2016)**

DISCUSSION

The sport and competitive characteristics of dancesport are accentuated most. The name of dancesport as a sport activity accentuates sportsmanship that cannot be imagined without matches, i.e., contention among dancers (competition).

Năstase (2012) defines dancesport as a kind of pair sport, which result is assessed with a subjective score and which acts must be coordinated (exact collaboration in a certain segment of time). The aesthetical criterion is decisive in the assessment of dancesport (Soraka, 2007). Physical and artistic capabilities in dancesport are manifested together with social ones and constant use of capabilities enables developing them.

Matzdorf and Sen (2015) performed a scientific study in order to reveal the elements of dancers' leadership and following and determine the way of relation between these phenomena and activity of organizations. In order to reach the goal, the researchers also provided examples from the practice of dancers and coaches stating that the interaction, such as competition, collaboration, coordination and team work, is obligatory for dancers. The scientists determined an important trait of dancesport – to feel the space in different ways including the management of competition and collaboration situations simultaneously. This important statement confirms that the environment of dancesport is suitable for the manifestation of such forms of the interaction as competition, collaboration, coordination and team work. It confirms that the management of collaboration and competition is obligatory and must be simultaneous. Meanwhile, Pytlik (2009) states that dancesport has an influence on social processes: encourages competing expeditiously and single-mindedly in a friendly and benevolent environment. Moreover, he accentuates that it is not only sport as a physical education program, but also a kind of universal activity: the posture, character, respect to the other sex and favourable interaction among people are developed.

Schupp (2015) proved with his research that learning in dance classes by using collaboration capabilities can prepare students for the practical activity of life beyond the scientific institution better including the career possibilities. In turn, the improvisation in dancing and choreography and creativity in dance halls encourage special collaboration and provide with experience of collaboration.

Smith and Betts (2000) confirm that the activity and results of a learning group will be more effective if the group members also use the principles of striving for their personal goals in their collaboration. They revealed in the study that the principles of striving for personal goals in collaboration were only effective if they also improved the results of a separate individual. According to the principles of striving for personal goals, all members of a collaborating group must be independent and free since the very beginning of their activity on striving for the common goal.

Pavlidou, Sofianidou, Lokosi, and Kosmidou (2018) determined that collaboration in a couple, responsibility and a sense of commonness are important for the relations of communication in dancing. Moreover, the authors emphasize an especially important role of the teacher (coach) as he/she interacts with dancers and can affect and manage the communication process by motivating, consulting, praising, disciplining or giving other advice.

The dance interaction is a reflective process involving partners of a couple, their coaches and surrounding social environment. The effectiveness of the interaction depends on the closeness of relations among interacting people and their communicative capabilities (Jovaiša, 2007). When dancers work together (in a couple), they must be sensitive and attentive to moves of each other and coordinate their mutual decisions and acts sometimes (interpersonal interaction capabilities).

McCabe, Wyon, Ambegaonkar, and Redding (2013) analysed the contribution of scientists into the research of dancesport in order to help to understand dancesport dancers better. This study revealed some interesting generalizations. First, they emphasized the self-expression, performance, sportsmanship and social relations as some of the motives to do dancesport. Moreover, the dancers said that dancesport is full of narcissism and competition. Second, dancesport is a kind of competitive sport related with the monetary prize fund and world rating. Thus, the motivation in the sport activity is directed to the physical improvement of the sport performance because the benefit obtained by dancers (prizes, fame, world recognition etc.) can depend on the culture of competition in dancesport.

It can be concluded that the development of sport capabilities in dancesport takes place together with the development of artistic capabilities when art helps to perform social roles. The conception of artistic education based on the effect of the environment

and interpersonal interaction as well as social interdependency confirms the educational presumptions of dancesport. The interpersonal interactions of dancers experienced in dancesport, such as collaboration, competition and coordination, make the theoretical basis of empiric learning. As it is necessary in dancesport to manage collaboration and competition situations simultaneously, it allows stating that the coordination of these capabilities is experienced.

CONCLUSIONS

The theoretical model of the educational presumptions of the coordination of collaboration and competition in dancesport reveals the conceptual basis of the educational presumptions of the coordination of collaboration and competition in dancesport. The level of compatibility of collaboration and competition in dancesport and its essential structural parts can be analysed taking into account the interpersonal relations of dancers in a certain situation. Besides, the structural elements of collaboration and competition can be determined and adapted to concrete situations in the dancesport activity.

Dancesport dancers act and strive for sport and personal goals by using collaboration and competition capabilities, coordinating them and reaching the higher form of coopetition (harmony). The educational presumptions of the coordination of collaboration and competition in dancesport are based on the analysis of literature about the forms of the interpersonal interaction both in the social environment and sport activity, manifestation of discussed forms of the interaction and theory of empiric learning including capabilities.

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Received on March 18, 2019
Accepted on March 20, 2019

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 13–18; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.774

SHOOTING ANALYSIS OF LITHUANIAN NATIONAL BASKETBALL MEN'S TEAMS IN DIFFERENT AGE CATEGORIES

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ABSTRACT

Background. One of the most important problems for players, coaches and scientists is improving the accuracy of shooting the basket. It is the most important technique for playing basketball, and its dependence on performance is multifaceted.

Methods. All 37 games in the 2015 European Championships in U16, U18, U20 and men's national team were analyzed. Data was selected from the official boxscores of FIBA (International Basketball Federation). The following absolute game-related statistics were gathered: free-throws, 2-point and 3-point field goals (both successful and unsuccessful). The obtained values of the rate of success of 2-point, 3-point and free throw shooting were tested by the non-parametric Mann–Whitney *U*-test. The statistical analyses were performed using SPSS for Windows, version 20.0, and statistical significance was set at $p < .05$.

Results. Comparing the number and accuracy of shots taken from 2-point distance, we found that there was no significant difference between men of different ages ($p > .05$). Most 3-point shots were done by U16 youth team, the least was in men's national basketball team, a significant difference in the indicators ($p < .05$) was found between all the teams, except between men's national team and U18 ($p > .05$). Comparing free-throws' indicators between different age groups, most throws were done by U16 team, the least were done by the U20 team ($p < .05$); however, there were no differences between the other significant indicators ($p > .05$). Comparing free-throws accuracy indicators between the different age groups of basketball teams, significant differences in indicators were found between men's national basketball team and U20, U16 ($p < .05$).

Conclusions. The count of 2-point shots made in Lithuanian different age basketball national team games was more or less similar. Most 3-point shots were made by U16 team and the national men's team made least 3-pointers. The indicators of accuracy did not have a significant difference between national teams, except for free throws: men's national team made these shots most accurately, opposite situation was with U16 team.

Keywords: basketball, national teams, shooting, quantitative and qualitative indicators.

INTRODUCTION

One of the most important areas of sports science research is the research of the variables of the competition activity (game), the change of their characteristics in the most important competitions (O'Donoghue, 2010). Recording and evaluating player readiness and performance indicators is the fundamental function of the management of basketball players' sports training (Malarranha, Figueira, Leite, & Sampaio, 2013). The analysis of the performance indicators of the Worlds and Europe best basketball teams provides a lot of objective information about the basketball game, its development and the results achieved (Kreivyte et al., 2013). It is possible to evaluate the team game, its change by analysing the quantitative (rebounds, shooting into basket from different distances, free throws, etc.) and qualitative (accuracy of shooting) indicators (Csataljay, James, Hughes, & Dancs, 2012). One of the most important problems for players, coaches

and scientists is improving the accuracy of shooting the basket (Erčulj & Štrumbelj, 2015; Gómez, Alarcón, & Ortega, 2015; Ibanez, Santos, & Garcia, 2015). Basketball is the most important technique for playing basketball, and its dependence on performance is multifaceted (Skinner, 2012).

While playing, the accuracy of the shoots is determined by the biomechanical parameters of the action (Ammar, Chtourou, Abdelkarim, Parish, & Hoekelmann, 2015), and the stability of the movements (Uygur, Gottepe, Ak, Karabörk, & Korkusuz, 2010), the ability of the body to adapt to various intensity and nature physical loads (Montgomery, Pyne, & Minahan, 2010), and player psychics (Mellalieu, Neil, Hanton, & Fletcher, 2009). The turn of shooting the ball indicators during the match is influenced by active rival defence actions, the defence system, the physical and mental state of the players, depending on the importance of the match and their result. In addition, it is especially important from what distance from which place of the court is and how it is shot (Gómez et al., 2015).

The turn of the shooting the basket indicators during the match is influenced by active rival defence actions, applied defence systems, physical and mental state of the players, depending on the importance of the match and the result. In addition, it is especially important from what distance from which court place and how it is shot (Gómez et al., 2015). Lithuanian national men's basketball team and youth teams of different age at the European championships show very high results, so it would be important to set quantitative and qualitative indicators for basketball shootings (2-point and 3-point field-goal and free-throw percentages) and their differences between teams in different age categories.

Hypothesis. The accuracy of men's basketball shooting is improving with age. This assumption is based on monitoring the evolution of male development.

The aim of this study was to determine and evaluate quantitative and qualitative indicators of basketball shots of different age groups of Lithuanian national basketball teams.

METHODS

Sample and variables. All 37 games in the 2015 European Championships in U16 (9 games), U18 (9 games), U20 (10 games) and men's national team (9 games) were analyzed. Data was selected from the official boxscores of FIBA (International Basketball Federation). The following absolute game-related statistics were gathered: free-throws, 2-point and 3-point field goals (both successful and unsuccessful).

Statistics analysis. From the primary data on the absolute number of shots and successful throws we calculated the percentage rate of success of the observed shooting in the given men's age category. Percentage values of the rate of success of 2-point, 3-point and free throw shooting and the level of statistical significance were expressed in the form of a graph. In the course of the whole research we also used alternative methods of logic. The obtained values of the rate of success of 2-point, 3-point and free throw shooting were tested by the non-parametric Mann–Whitney *U*-test. The statistical analyses were performed using SPSS for Windows, version 20.0 (SPSS Inc., Chicago IL), and statistical significance was set at $p < .05$.

RESULTS

Lithuanian national men's basketball team attempted around 40.9 ± 8.0 shots from 2-point distances during one European championship game, U20 team attempted 38.4 ± 7.4 throws, U18 team attempted 44.6 ± 9.3 throws and U16 team attempted 40.6 ± 6.7 throws. The most 2-point shootings were done by the U18 team and the least was by the U20 team, however there was no difference between all the significant variables ($p > .05$) (Figure 1).

Accuracy indicators of 2-point throws: men's basketball team made throws at 44.8 ± 11.3% accuracy, U20 youth team shooting accuracy indicator was 48.1 ± 4.2%, U18 team 2-point shots accuracy indicator was 44.2 ± 7.1% and U16 team shooting accuracy was 48.5 ± 6.7%. Comparing the accuracy of shots taken from 2-point distance, it indicates that there was no significant difference between teams of different ages ($p > .05$) (Figure 2).

Men's national basketball team during the European championship match averaged 16.7 ± 4.3 shots from 3-point distance, U20 team averaged 23.4 ± 3.7 shots, U18 team averaged 18.6 ± 5.2 shots, and U16 team averaged 28.2 ± 6.2 shots. Most 3-point shots were performed by U16 youth team, the least was in men's national basketball team, a significant difference in the indicators ($p < .05$) was found between all the teams, except between men's national team and U18 ($p > .05$) (Figure 3).

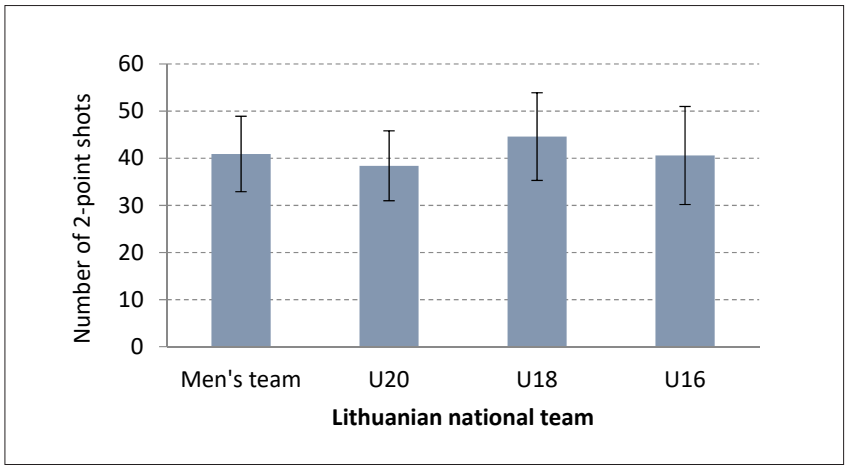

Figure 1. **The number of 2-point shots for men's basketball teams in the European championship matches (average per one game)**

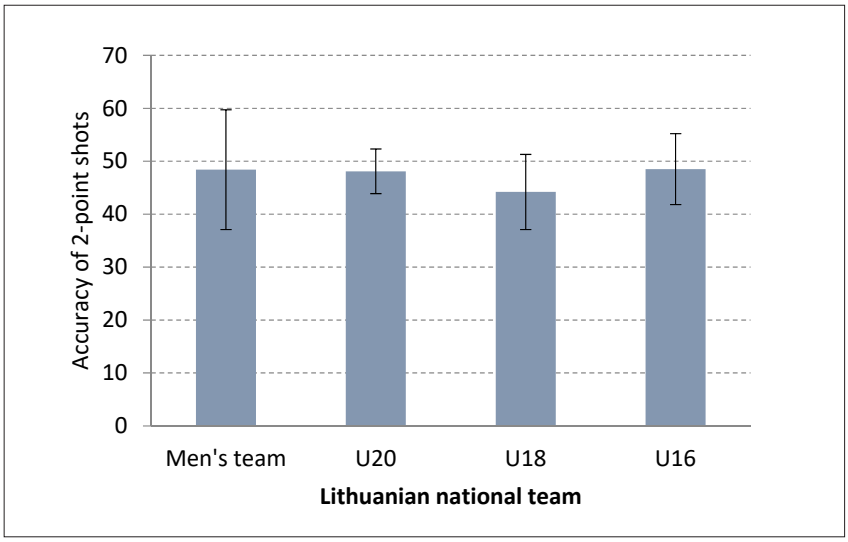

Figure 2. **The accuracy of 2-point shots for men's basketball teams in the European championship matches (average per one game)**

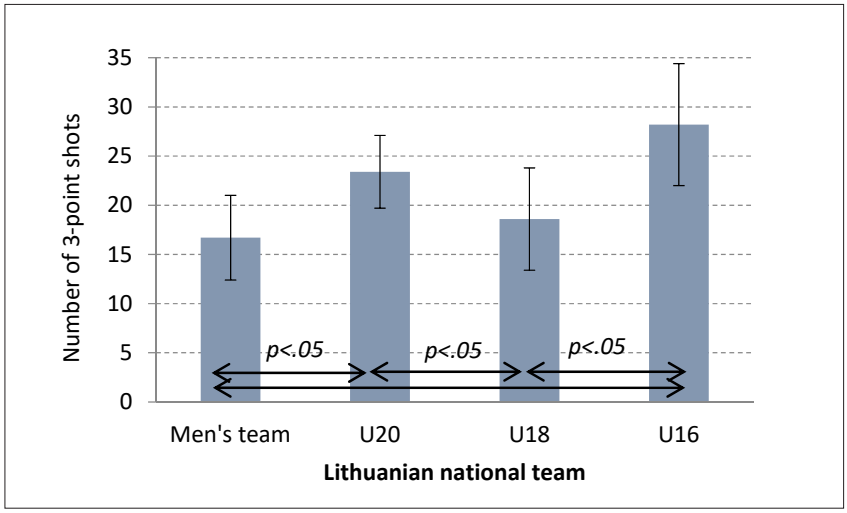

Figure 3. **The number of 3-point shots for men's basketball teams in the European championship matches (average per one game)**

Accuracy indicators of 3-point throws: the men's basketball team from near and long range shots attempted 33.9 ± 12.3% accuracy, U20 team throw accuracy indicators were 28.5 ± 9.5%, U18 team three-point shot accuracy indicators were 32.0 ± 7.1% and U16 team shot accuracy were 32.7 ± 9.4%. Comparing shots from long-range accuracy indicators between the different age groups of basketball teams, the best results from 3-point distance were showcased by the men's national basketball team, however, there were no significant differences between the variables ($p > .05$) (Figure 4).

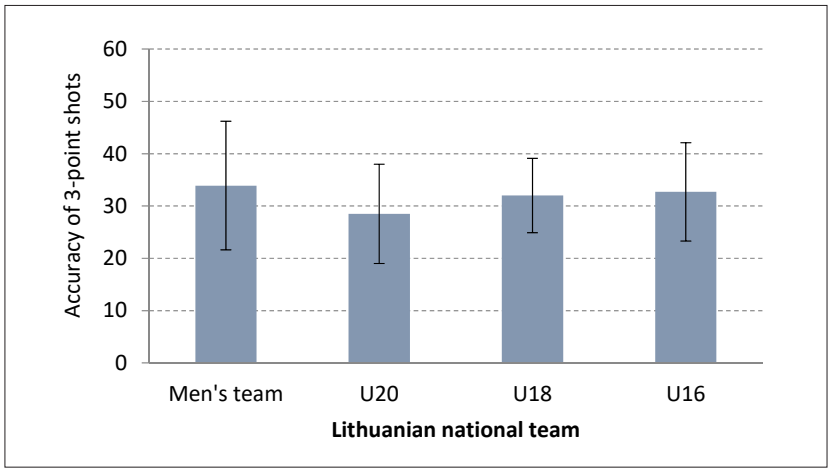

Figure 4. **The accuracy of 3-point shots for men's basketball teams in the European championship matches (average per one game)**

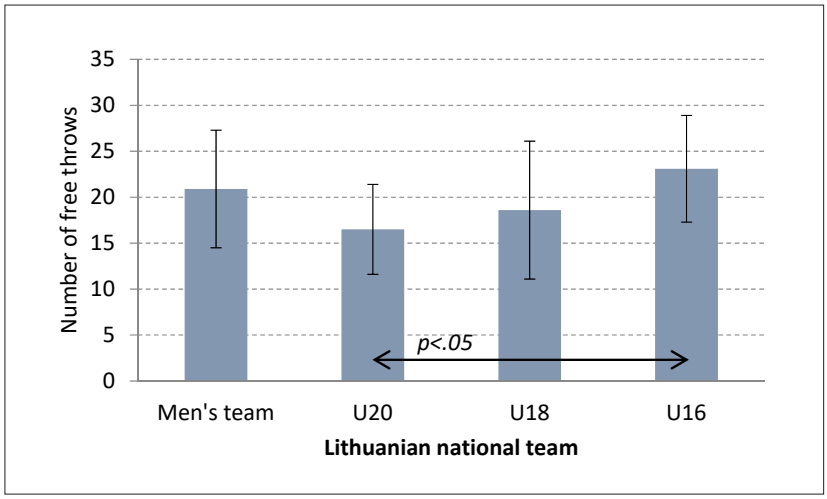

Figure 5. **The number of free throws for men's basketball teams in the European championship matches (average per one game)**

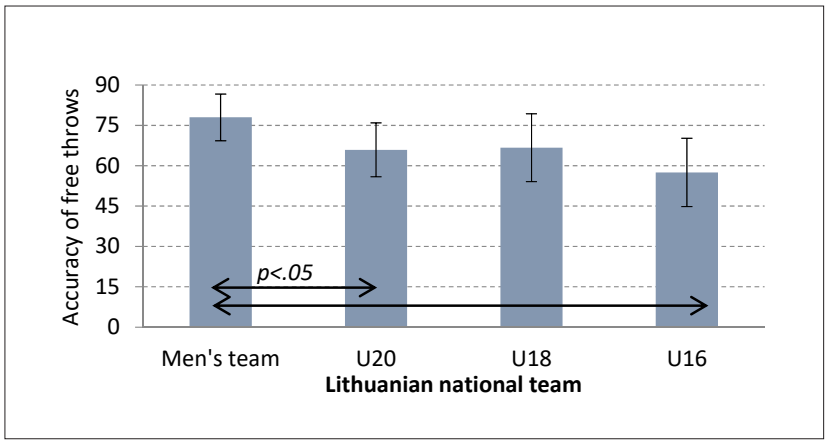

Figure 6. **The accuracy of free throws for men's basketball teams in the European championship matches (average per one game)**

Men's national basketball team attempted 20.9 ± 6.4 free throws per game, U20 team had 16.5 ± 4.9 free-throws, U18 team attempted 18.6 ± 7.5 throws and U16 team had 23.1 ± 5.8 throws. Comparing free-throw indicators between different age groups, most throws were performed by U16 team, the least were done by the U20 team ($p < .05$) however, there were no differences between the other significant indicators ($p > .05$) (Figure 5).

Accuracy indicators of free-throws: men's national basketball team's attempted free-throws had accuracy of 78.0 ± 8.7%. U20 team free-throw accuracy indicators were 65.9 ± 10.1%, U18 team free-throw accuracy indicators were 66.7 ± 12.6%

and U16 team free-throw accuracy was 57.5 ± 12.7%. The best results from the free throws were showcased by the men's national basketball team. Comparing free-throw accuracy indicators between the different age groups of basketball teams, significant differences in indicators were found between men's national basketball team and U20, U16 ($p < .05$). No significant difference was observed ($p > .05$) between men's national basketball team and U18 team (Figure 6).

DISCUSSION

The main aim of this research was to compare the shooting indices of the Lithuanian national basketball men's teams in different age categories. During the professional games between men teams, the end of the match is determined by the total number of successful shots, especially from 2-point distances (these throws make up the major part of the final result). Our researched team's 2-point shots number in the games reached 41–44 throws. Decrease in number of these shots (by 8–10 shots) has been observed in the last European championships (Kreivyte et al., 2013). Decrease of these throws might have been due to active defence practices in restricted area because of increased number of 3-point shots. Lithuanian different age group team shots' precision 2-point distance indicators were poor, accuracy ratio did not even reach 50%. The best results for the best 2-point shots were achieved by men and U16 team whose accuracy stood at 48%. Many authors (Csataljay et al., 2012; Skinner, 2012) developed an assumption that 2-point shots accuracy can often result in the end of the games. The number of successful shots from 2-point distances and accuracy are indicators of effective attacks, which proves that winning teams are tactically more disciplined, having clearer tasks. Oliver (2004) asserts that in a basketball team whose game pace is slower, 2-point distance shot accuracy is higher. The author assumes that team coaches are getting ready for the game and focusing on improving these throws as well as improving ball control. Our analysed team's 3-point shots during games are much higher compared to other national teams. The most 3-point distance shots are done by U16 team (on average 28 shots per game); the least 3-point distance shots are being done by men team (in average 17 shots per game). It has been established that losing teams at the end of the games are usually trying to save the result by conducting 3-point distance shots, therefore, in games where result is very tight, winning teams have less 3-point distance shots, but their accuracy is higher (Lorenzo et al., 2010; Gómez et al., 2015). The number of free-throws per game indicates team's activeness while organizing and executing attacks when opponent uses active defence systems (Csataljay et al., 2012). The accuracy of free-throws shows players' actions under the pressure of physical and psychological pressure, consistency, mental strength as well as reliability (Uygur et al., 2010). Lithuanian men's basketball team was not active in free-throws compared to European champion – the Spanish team, additionally, Lithuanian free-throws' accuracy was lower compared to the champions' team. It has been ascertained that the best player's free-throw precision ratio in the games was 76%. Shot accuracy which reaches 90% and more is considered the best, whereas the ratio which reaches 65% is considered low (Vickers, 2007). Free-throw precision indicators in different youth age group (U16, U18, U20) teams were much lower compared to adult men's team. There was a hypothesis that the accuracy of the throws should improve with age, but the results only partially confirmed the hypothesis: the results of the U20 team's 3-point and fine throws were not better than those of the U18 team.

CONCLUSIONS

The count of 2-point shots made in Lithuanian different age basketball national team games was more or less similar. Most 3- point shots were made by U16 team and the national men's team made least 3-pointers. Comparing shots from the free throw line, the leaders were U16 team. U20 team rarely made free throws. The indicators of accuracy did not have a significant difference between national teams, except for free throws: men's national team made these shots most accurately, the opposite situation was in the U16 team. The accuracy of 2-point shots, 3-point shots (except for U18 team) and free throws between various age national teams was similar.

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Received on February 27, 2019
Accepted on March 21, 2019

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 19–25; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.775

THE EFFECT OF ANIMATED PLAY PROGRAM ON IRREGULAR POSTURE FORMATION IN PRESCHOOL CHILDREN

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ABSTRACT

Background. Insufficient back muscle tone of 6–7-year-old children does not guarantee stable spin curves. The preschool children's posture is an important society problem that raises the scientists interest (Okely, Trost, Steele, Cliff, & Mickle, 2009), when posture is formed during the pre-school period and taking into account fine motor skills peculiarities, it is possible to ensure the optimal movement function (Rodger & Vishram, 2010). The purpose of this study was to identify the need for animated play programs and risk factors for the development of about 4–7-year-old children's abnormal posture.

Methods. We analysed annual preventive health collaborating with public health professionals and pre-school medical personnel. Two social surveys were conducted using an anonymous online questionnaire for respondents. The first survey included questions to parents/caregivers (interpersonal level) in order to establish the psychomotor development of children up to one year of age and possible causes of abnormal posture formation. The second survey had questions to the kindergarten educators and administration (organizational level) in order to find out the need for animated play programs in the educational process. The survey questions were based on the child's motor development principles. Research participants were 311 parents/caregivers and 117 kindergarten educators. Anonymous online surveys were conducted between October and December of 2018.

Results. According to the analysis of annual preventive health indicators, less than half of the pre-school age children were healthy in Kaunas city and with the age the number of healthy children decreased. Analysis of preventive health checks in pre-school children showed that skeletal muscle disorders were most common in children aged 4 to 6 years. Parents/caregivers, kindergarten educators and the administration indicated that physical activity had a positive effect on the child's posture in the educational institution, but parents/caregivers had doubts that kindergarten had a favourable environment for the child's posture correction.

Conclusion. As a result, most kindergarten educators and administrators as well as parents/caregivers believed that animated play programs in kindergarten would help to improve posture.

Keywords: preschool child, physical activity, posture, animated play program.

INTRODUCTION

In preschool age, intensive biological maturation takes place in children's brain and it determines the dispersion of the child's natural powers, physical, cognitive, emotional, social development, and have influence on the success at school and further life (Visagurskienė & Grigonienė, 2016). Good motor skills affect the physical, social and psychological development of children, but this connection is yet not well understood. Pre-school age is crucial for the development of motor skills, as they improve not only through the movement, but also through sensory perception, which integrates into complex and interconnected forms, strongly evolving language that controls human actions (Visagurskienė & Grigonienė, 2016). Good motor skills have been shown to have a positive effect on the cardiovascular system (Lubans, Morgan, Cliff, Barnett, & Okely, 2010), body weight (Lubans

et al., 2010; Morano, Colella, & Caroli, 2013) and overall body condition (Viholainen et al., 2014). The Danish preschool educational institutions pay special attention to the development of motor skills – creating and implementing programs, and projects that integrate ten thousand children (Hestbaek et al., 2017).

Inactivity negatively affects the musculoskeletal system: it decreases muscle strength, static and dynamic endurance, and tone. Insufficient back muscle tone of 6–7-year-old children does not guarantee stable spin curves (Davison & Jago, 2009). The preschool children's posture is an important society problem that raises the scientists interest (Okely et al., 2009), when posture is formed during pre-school period and, taking into account the peculiarities of fine motor skills, it is possible to ensure the optimal movement function (Rodger & Vishram, 2010). Carrying out the annual preventive children's health checks (order No. 301 of the Minister of Health of the Republic of Lithuania of 31 May 2000), the proportion of absolutely healthy children was 35.5 percent of prophylactically examined children in the school year 2017/2018. The data showed that with children's age the health proportion decreased. One of the major children health problems are skeletal muscle disorders, which were found in 15.1% of the prophylactically examined children. It is known that during the corrected exercises (physiotherapy) the whole movement system improves when the neck, shoulders, abdomen, back and hips are strengthened, also it improves speed, strength, endurance, mobility, the muscles engaged into the work, metabolic circulation and reduces pain (Macanovic & Momčinovic-Gajic, 2010). Bendixen and Kreider (2011) showed that using gaming interventions, fine motor skills and vision-related motor skills clearly improved.

Games are a normal process in pre-school age children that gives them joy and relaxation, giving the opportunities to develop their cognitive abilities, allowing to express emotions, develop fantasy and creativity. While playing a child learns about himself/herself, others and the world, learns, how to filter the information. Pre-school children spend few hours playing on a computer (Davison et al., 2011), usually using mobile phones with certain online platforms. However, the hypokinesia should not be forgotten as a negative effect on musculoskeletal system, and the lack of hypokinesia does not guarantee 6–7-year-old children's stable spin curves (Wojna, Anwajler, Hawrylak, & Barczyk, 2010). According to research, children should use a targeted physiotherapy program as a preventive measure to avoid postural and fine motor skill disorders (Dobbins, Corby, Robeson, Husson, & Tirilis, 2009). Therefore, animated play programs could be one way to help solve posture problems. Of course, it includes a multitude of challenges and virtual worlds of imagination. Therefore, a thoughtful and creative applicable design program should be created to draw the player in the proposed activities. Animated play programs, where players-children create stories with beloved fairy tales or cartoon characters, create songs through playing activity and imagination, will motivate them to engage in a targeted physiotherapy program more as a preventive measure to avoid posture and fine motor skill disorders. Nowadays, there are no Lithuanian language animated play programs that thoughtful and creative game design gaming programs would perfectly involve the player into the proposed activities.

This research is motivated by the need to explore some of the challenges and related opportunities at the intersection of the appearing skeletal muscle disorders and physical activity related behavior modification challenges in children, and the growing role of gamification and learnification on innovative technologies in recent years in the lives of these pediatric digital natives. While there is some early evidence of the positive impact of video games on fine motor skills in children (Bendixen & Kreider, 2011), the mechanisms underlying these improved outcomes are yet to be understood. Hence, it is important to identify the possible factors to physical activity. It is known that parental education is one of contributing factors in children's physical activity (Santos, Esculcas, & Mota, 2004), also kindergarten educators play an important role to physical activity in children life (Ball, Cleland, Timperio, Salmon, & Crawford, 2009).

Thus, the purpose of this study was to identify the need for animated play programs and risk factors for the development of 4–7-year-old children's abnormal posture. Objectives:

1. To evaluate the demand of animated play programs according to the annual preventive child health examinations data of preschool aged children.
2. To determine the need of animated play programs at interpersonal (parents/caregivers) and organizational (kindergarten educators and administration) levels.

METHODS

Organization of research. We performed the analysis of annual preventive health indicators (order No. 301 of the Minister of Health of the Republic of Lithuania of 31 May 2000) using data from no. 0.27-1/an examination form in collaboration with public health specialists and preschool medicine staff. This form of examination (No. 0.27-1/a) showed child's health status: blood pressure, hearing, sight, bone and muscle, respiratory and nervous system disorders. There is also a conclusion about the physical fitness of the pupil – child to be attributed to one of three physical education groups. Data of children development disorders and sickness rates are provided by Kaunas City Municipality's Public Health Bureau, which performs one of its functions – public health monitoring. The sickness rates analysis of pre-school age children is based on the examination form no. 0.27-1/a. data, which is provided by public health specialists.

The need for animated play programs at interpersonal (parents/caregivers) and organizational (kindergarten educators and administration) levels. Two social surveys were conducted using an anonymous electronic questionnaire for respondents. The first survey presents questions to parents/caregivers (interpersonal level) in order to find out the psychomotor development of children up to one year of age and possible causes of abnormal posture formation and the need for animated play programs in the educational process. The second survey presents questions to the kindergarten educators and administration (organizational level) in order to find out the need for animated play programs in the educational process. The surveys were based on the child's motoric development principles. The interpersonal level assessment survey consisted of 20 questions about child's abnormal posture, physical activity in the kindergarten, preventive measures, and the need for animated play program in the educational institution. The organizational level assessment survey consisted of 12 questions about providing assistance to children with position and motion disorders, physical activity in kindergartens, employee competences, preventive measures and the need of a play program in the educational institution.

As many as 311 parents/caregivers aged 31–40 years (6 percent up to 25 years old, 19 percent 25–30 years old, 9 percent more than 41 years old), participated in the survey together with 117 kindergarten educators and administrators.

Anonymous online surveys were conducted between October and December of 2018. The subjects were randomly selected. Before completing the survey, in the first survey page the purpose of the study was explained for subjects, it also explained the possible uncertainties. Completing the survey took 12 minutes on average. The data were processed and analysed using the statistical package SPSS 13.0. To test the hypothesis, a chi-square test (χ^2) was applied, and a statistical conclusion reliability level was $p < .05$.

RESULTS

Analysis of annual preventive health indicators. The 13306 preschool children attended educational institutions at 2018/2019 school year in Kaunas City Municipality. Preventive health was checked in 13209 pre-school children. The proportion of fully healthy students was 35.4 percent of prophylactically tested children. With the children's age the proportion of completely healthy children decreased (Figure 1).

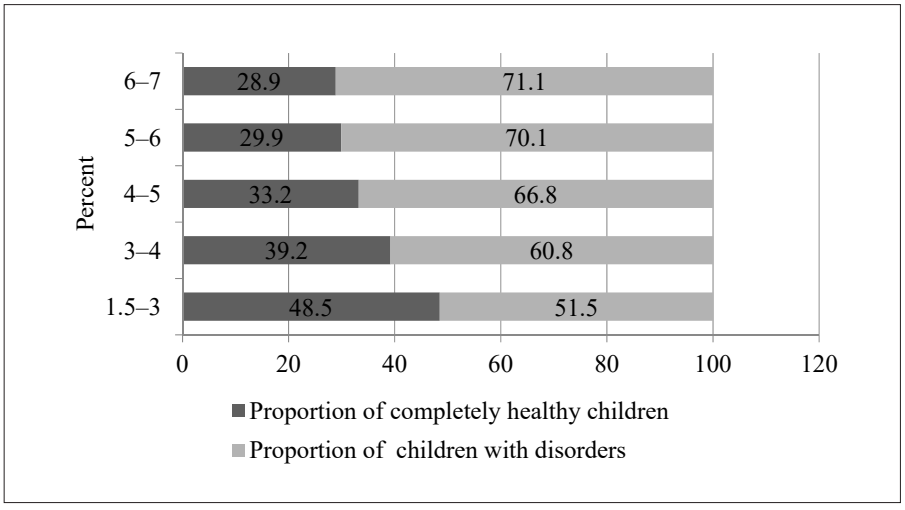

Figure 1. **Percentage of completely healthy children by age**

During preventive health checks, the Body Mass Index (BMI) was evaluated for 10799 –pre-school children. Normal BMI was found in 96.30% of children. The 2.40% of pre-school children had too low body weight, 1.10% were overweight and 0.2% had obesity (Figure 2).

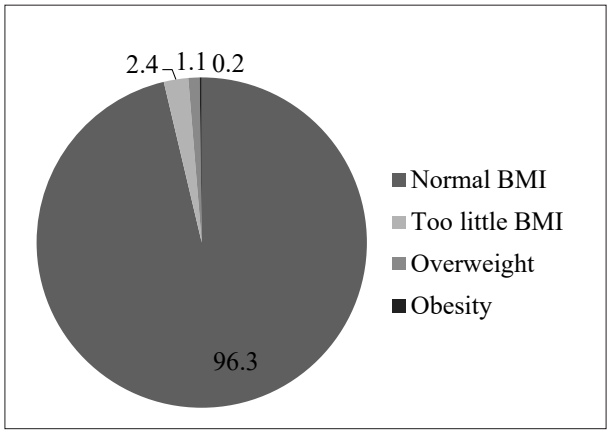

Figure 2. **Distribution of body weight index for children with body mass index (%)**

The analysis of preventive health checks for preschool children showed that the main disorders were visual, skeletal-muscle disorders and language defects. Musculoskeletal disorders were detected in 16.40% of children. The types of children's musculoskeletal disorders were found as scoliosis (1.80% of children) and posture disorders (15.90% of children). Musculoskeletal disorders are usually found in children aged 4 to 6 years (Figure 3).

The need for animated play programs at interpersonal (parents/caregivers) and organizational (kindergarten educators and administration) levels. The results showed that parents/caregivers (66%) indicated that their children had no posture problems, 20% had posture problems, 14% did not know. The majority of parents/caregivers (88%) believed that physical activity had a positive effect on children's posture. More than half of the parents/caregivers (52%) believed that children did not get enough information about irregular posture, 33% of parents/caregivers did not know and 15% of parents/caregivers believed that children received enough information about irregular posture in the kindergarten. More than half of the interviewed parents/caregivers (54%) did not know or doubted that the kindergarten had a favourable environment for the posture correction, 24% agreed that this educational institution had a favourable environment and 13% thought that that a kindergarten had favourable environment for children's posture correction (Table 1). Parents/caregivers made suggestions to improve irregular posture: "Explanations for children, visual

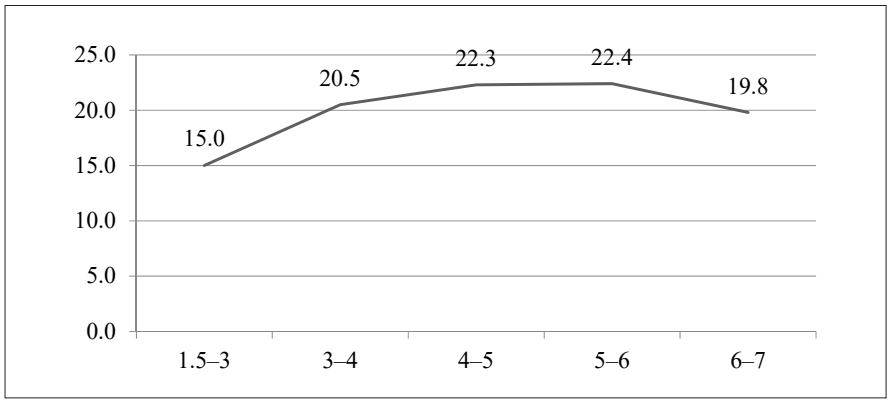

Figure 3. **Distribution of musculoskeletal disorders by age (%)**

Statements	Yes	No	Don't know	
Does your child have posture problems?	20	66	14	
In your opinion, do physical activities in the educational institution have a positive effect on the child's posture?	88	6	6	
Do you think that children get enough information about irregular posture?	15	52	33	
Do you think the kindergarten has a favourable environment for posture correction?	**Yes**	**Don't know**	**Partly**	
	24	54	13	
Do you think animated exercise in kindergarten would improve posture and flat feet activities?	**Yes**	**No**	**Don't know**	**Partly**
	77	1	9	13%

Table 1. **Percentage distribution of parents/caregivers identifying possible causes of irregular posture**

information", "It would be good if the physical activity lessons, as well as the children sitting (when eating, drawing, and playing), emphasize standing, sitting and overall posture", "Exercises are needed".

Kindergarten educators and administration (76%) indicated that their institution provided qualified help for children with positioning and movement disorders. Almost all kindergarten educators and administrations (97%) pointed out that they paid attention to the children's irregular posture during the education process. More than a half of kindergarten educators and administrations (65%) indicated that when they notice children' irregular posture, they always correct it, sometimes (34%) of kindergarten educators and administrations admitted making the corrections. The kindergarten educators and the administration indicated that special exercises (corrective-physiotherapy) for posture corrections (46%) were carried out in their institution during physical activity, but 54% of the respondents observed that there were no special exercises (corrective-physiotherapy) for posture corrections. Only 17% of kindergarten educators and administrations indicated that they had enough knowledge and skills to work with children positioning and movement disorders, 37% of respondents noticed that they had not enough knowledge and skills and 46% of respondents noticed that they doubted about their knowledge and skills. Most of the kindergarten educators and administrators (54%) thought that animated exercise in kindergarten would help to improve irregular posture, 27% of kindergarten educators and administrations partially thought so, and 17% of the kindergarten educators and administrations had no opinion on this issue (Table 2).

The correlation calculation results between parents/caregivers and kindergarten educators/ administration that animated exercise in kindergarten would help to improve irregular posture showed strong links (.830). The correlation calculation results between parents/caregivers that physical activities in the educational institution had a positive effect on the child's posture and kindergarten educators/administration that the support was qualified for children with positioning and movement disorders would help to improve irregular posture showed average links (.630). The correlation calculation results between parents/ caregivers that children got enough information about irregular posture in kindergarten and kindergarten educators/administration that they paid attention to the children's irregular posture during educational process showed average links (.560). The correlation calculation results between parents/caregivers that children got enough information about irregular posture in kindergarten and kindergarten educators/administration that they always corrected the children's irregular posture during educational process showed average links (.530). The correlation calculation results between parents/caregivers that the kindergarten had a favourable environment for posture correction and kindergarten educators/administration that there were special exercises (corrective-physiotherapy) for posture corrections in the kindergarten showed average links (.560). The correlation calculation results between parents/caregivers that the

Table 2. **Percentage distribution of educators and administration identifying the need for play programs in the educational process**

Statements	Yes (%)	No (%)		
Is the support qualified for children with positioning and movement disorders?	76	24		
Do you pay attention to the children's irregular posture during educational process?	97	13		
Are there special exercises (corrective-physiotherapy) for posture corrections in the kindergarten?	46	54		
Do you always correct the children's irregular posture?	**Yes**	**No**	**Sometimes**	
	65	1	34	
Do you have the knowledge and skills to work with children with positioning and movement disorders?	**Yes**	**No**	**Doubt**	
	17	37	46	
Do you think animated exercise in kindergarten would help to improve irregular posture?	**Yes**	**No**	**Don't know**	**Partly**
	54	1	17	27

kindergarten had a favourable environment for posture correction and kindergarten educators/ administration that they had the knowledge and skills to work with children with positioning and movement disorders showed average links (.540).

DISCUSSION

According to the analysis of annual preventive health indicators, the number of healthy pre-school children was 35.4% of prophylactically tested children in Kaunas city. The proportion of completely healthy children decreases with the age. An analysis of preventive health checks for preschool children have shown that the main disorders of children are visual, skeletal-muscle disorders and language defects. Musculoskeletal disorders were detected in 16.4% of prophylactically tested children. Musculoskeletal disorders were usually found in children aged 4 to 6 years. Also parents/caregivers (66%) have reported that skeletal muscle disorders are quite common in their children's life. Good motor skills are considered important for children's physical, social, and psychological development (Gallahue &Ozmun, 2002) and may even be the foundation for an active lifestyle, since several studies have shown a positive association between good motor skills and higher levels of physical activity (Lubans et al., 2010). Consequently, there is evidence of many health benefits to be gained from an improvement in motor skills. For instance, it has been demonstrated that good motor skills positively influence cardiorespiratory fitness (Lubans et al., 2010) and body weight (Morano at al., 2011) as well as sports participation (Krombholz, 2010), all suggesting that early competency in motor skills may have important health implications. Furthermore, there are indications of relationships with language development (Vukovic et al., 2010), executive function (Diamond & Lee, 2011), and general wellbeing (Viholainen et al., 2006). However, most of the existing studies on motor performance are either cross-sectional, and therefore do not provide evidence of a potential causal relationship, or they include only short-term follow-up. The majority of parents/caregivers (88%) have believed that physical activity has a positive effect on the child's posture in the educational institution, but parents/caregivers (54%) had doubt that kindergarten had a favourable environment for the child's posture correction. Parents/caregivers (52%) indicated that children did not get enough information about correct posture. Therefore, toddler and preschool age appears to be a particularly important period for the development of motor skills. Early childhood is also the age where practicing fundamental movement skills is necessary to create a foundation for more complex movement activities of daily living, recreation, and sports in later childhood (Gallahue & Ozmun, 2002). In Denmark, 92% of all 3–5-yearold children spend a high proportion of their waking hours at preschool (Lindelof, Nielsen, & Pedersen, 2013). Consequently, this arena provides an ideal opportunity for all children, despite socioeconomic background, to develop and improve their motor skills.

Kindergarten educators and administrators (76%) believe that their institution provides qualified assistance to children with positioning and movement disorders. Almost all kindergarten educators and administrations have pointed out that they pay attention (97% of respondents) to the child's irregular posture during the education process. Most of the kindergarten educators and administrators (54%), parents/caregivers (77%) have thought that animated play programs in kindergarten would improve posture and flat footing. Games have been shown to have positive impact on children (Serrone, 2012). Many children spend several hours a day playing video games (Roberts, Foehr, & Rideout, 2005), mostly on mobile devices, a platform through which they can learn about health in a fun and enjoyable way. This may be one approach to address the multi-faceted challenge of the paediatrics.

CONCLUSION

According to the analysis of annual preventive health indicators, less than half of the pre-school age children are healthy in Kaunas city and with the age the number of healthy children decreases. An analysis of preventive health checks in pre-school children has shown that skeletal muscle disorders are most common in children aged 4 to 6 years. Parents/caregivers, kindergarten educators and the administration have indicated that physical activity has a positive effect on the child's posture in the educational institution, but parents/caregivers have doubt that kindergarten has a favourable environment for the child's posture correction. As a result, most kindergarten educators and administrators and parents/caregivers have believed that animated play programs in kindergarten would help to improve posture.

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Received on March 21, 2019
Accepted on March 27, 2019

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 26–33; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.776

FOREIGN LANGUAGE ANXIETY IN UNIVERSITY LEARNING: SELF-PERCEPTIONS OF STUDENTS ENGAGED IN SPORTS

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ABSTRACT

Background. Research aimed at the analysis of self-perceptions of students of foreign language anxiety in the classroom context in relation to its effect on foreign language acquisition. It focused on foreign language, as a skill needed for versatile education, which would lead to a successful career in sports or would aid in pursuing health enhancing leisure activities later in life.

Methods. The qualitative approach of research was adopted in this study. Twenty subjects involved in the study programs as Sports Coaching at the Lithuanian Sports University and Medicine at the University of Health Sciences participated in the research. A semi-structured interview was conducted by the researchers based on 10 open-ended questions about foreign language anxiety.

Results. Although the perceptions of students' own English language competence were found to be an important source of anxiety for the interviewed students, most of the respondents perceive the necessity of trying to cope with stress and anxiety themselves. In addition, instructors appeared to be creating the feeling of relaxation rather than being the anxiety-provoking ones in the classroom.

Conclusion. Awareness of the fact that FLA really exists and appears to be an obstacle for students' academic achievement needs to be acknowledged. To address this issue, collaboration rather than competition must be implemented as a tool in classes for further advancement in learning. Therefore, these measures might help to reinforce self-esteem and achieve better results in the foreign language classroom and, thus, in the overall goal of studies in the student learning process.

Keywords: language acquisition, foreign language anxiety, higher education.

INTRODUCTION

Recent research of foreign language anxiety found that anxiety as a basic human emotion originates from the learner's own self (Scovel, 1991). A number of studies on anxiety report on the significance of it as an issue continuing to exist in the university foreign language classroom. A feeling of nervousness associated with foreign language learning is termed as foreign language anxiety (FLA). The construct of FLA was first investigated by Horwitz, Horwitz & Cope (1986). Horwitz, Horwitz, & Cope (1991) views FLA as a distinct complex of self-perceptions, beliefs, feelings, and behaviours related to classroom language learning arising from the uniqueness of the language learning process. MacIntyre (1998) conceives of LA as the worry and negative emotional reaction aroused when learning or using a second language. Recent research of foreign language anxiety has been focused on quantitative studies (Ghadirzadeh, Hashtroudi & Shokri, 2012) although a lack of information still exists about the phenomenon of FLA, its causes and effects on the foreign language acquisition and overall educational outcome of

students. Nevertheless, some researchers applied different methods of research, i.e. Tanveer (2007) focused on the qualitative format of the research and used semi-structured interviews and focus group analysis while examining FLA in the higher education context. In addition, there was research performed by Tóth (2011) and Riasati (2011) who aimed at deeper insight into the element of FLA by analyzing students' own perceptions on the reasons of FLA existing in the classroom. Consequently, an in-depth approach to the construct of language anxiety is needed in order to gain better understanding of FLA and the ways to eliminate or reduce it should be sought. Therefore, research aim was to investigate the self-perceptions of students, engaged in sports, about foreign language anxiety in the classroom context in relation to its effect on foreign language acquisition and overall academic achievement as well as to develop strategies how to alleviate foreign language anxiety in the university foreign language classroom.

METHODS

As the research aimed at the examination of FLA through the students' personal experiences, the qualitative approach of research was adopted in this study, as it allowed us to gain a deeper insight into the students' own perceptions about FLA as an obstacle for the progress of their academic development. Twenty subjects, engaged in sports or choosing sports activities during their leisure time, involved in the study programs as Sports Coaching at the Lithuanian Sports University (LSU) and Medicine at the Lithuanian University of Health Sciences (LSMU) participated in the research. They can be regarded as typical EFL learners with different FL level, learning the target language almost exclusively in a monolingual classroom, typically from non-native teachers of English, with limited or wider opportunities to use the language for communication outside the classroom. A semi-structured interview was conducted by the researchers based on 10 open-ended questions about anxiety (adapted from Tanveer (2007)).The procedure involved the pilot interviews to gather initial information. The instruction contained the theoretical background about the research as well as a written consent form was signed by the participants, that is, they voluntarily participated in the research knowing that their reflections would be anonymous and their identity would be kept in secret. Secondly, a questionnaire asking about general background of students (age, gender, study program and English language level) was asked to fill in (Table).

Furthermore, 10 questions about FLA were asked during one-to-one interviews with the respondents so that to gain more explicit aspects, emotions and reflections about the phenomenon of anxiety. Each interview lasted 15–20 minutes. The received data were collected and analyzed using the coding system, breaking the material into comprehensible themes or subthemes and performing the reduction of the collected information.

RESULTS

The in-depth interviews revealed that the students' self-perceptions of foreign language may be analysed under headings as emotions and feelings of the students, psycho-physiological symptoms, FLA in classroom and real life, the role of mistakes, the role of a teacher, respondents' self-perceptions of their own language competence as well as strategies for alleviating FLA.

Positive/negative feelings and emotions. Most of students noted their satisfaction while learning English, so their experience appeared to be rather positive than negative one, the language provided the opportunity to know other cultures; they have built good knowledge of English, etc. Only one interviewee reported that his experience was both positive and negative.This positive attitude may be based on the perception of English being not a very difficult language to learn. However, there were situations at English classes when students felt discomfort and stressed.The most important reasons they offered as an explanation for their feelings of insecurity and discomfort was the fact

Table. **Respondents' background profiles**

University	Number of participants	Age	Gender (F/M)	Years of studying EFL	English language level
LSU*	10	19–21	4 /6	8–14	A2, B1, B2/C1
LSMU*	10	19–21	8 /2	Av. 10	B2/C1

Note.* LSU – Lithuanian Sports University, LSMU – Lithuanian University of Health Sciences.

that they dreaded being called upon and having to speak up in class, especially being unprepared for that. Also some of them get stressed when they had to give quick answers to the questions, when they were unable to express themselves or when the structure of the sentence was incomprehensible.

Psycho-physiological symptoms. The participants' English-related anxiety manifested itself in the form of rather unpleasant psycho-physiological symptoms. Different forms of fear were sometimes accompanied by physiological changes like blushing, getting confused, forgetting the words, and starting mumbling as the following excerpts show: *"My voice starts to shake and my palms get wet", "I forget what I was saying, I forget the words and use more simple ones"*. As the research showed most of the respondents try to cope with stress and anxiety: *"I try to calm down and stress tends to disappear"; "I feel confused, I blush, but then I try to concentrate and solve all my problems, like voice trembling"*.

Language classes vs. real-life situations. Firstly, most respondents reported that the most of language experience was gained in certain real-life situations (sports camps, competitions) but a few responders marked insufficiency of their FL experience and knowledge due to poor studying at school or university. They also noted that they could clearly express themselves in a foreign language despite making mistakes. Some of the respondents marked that it was easier to communicate with foreigners or close friends in a foreign language than participate in classes at the university.

Secondly, the main causes of anxiety in language learning in a classroom setting is a perceived standard, the opinion of other students and the teacher, and fear of the effect of their mistakes. All interviewees were of the opinion that speaking English in the classroom was different and more anxiety provoking than communicating with their friends and family members or even native speakers outside the classroom: *"I don't feel anxious when I speak to my friends or family members"; "When I am abroad and I speak to people I don't know I feel not stressed"; "People don't notice small mistakes and the most important thing is to be understood"*.

As shown by interviewees' comments, they see their English classes as the place where they constantly have to prove their high standard of English to their peers and the teacher, which causes FLA: *"Everyone speaks fluently in the classroom you must know and speak English well"; "The opinion of other students that you have to speak English fluently disturbs me most"*.

Mistakes and students' self-perception of L2 competence. The most common linguistic difficulties reported by the students were the lack of vocabulary, the complex nature of English grammar, pronunciation and accent.

The respondents pointed that the lack of English vocabulary, especially not knowing the professional terminology, led them to disturbance while learning and speaking the language ("<…> *not knowing different terminology in English").* Some of the students indicated that the English language was not difficult but lack of words made them feel confused ("<…> *but unknown words make understanding more difficult"*). The respondents encountered challenges in memorizing some words or problems in understanding the speaker as well *("I don't understand what people say to me"; "<…> not difficult but unknown words make understanding more difficult"; "<…> it's difficult because of unclear pronunciation of other people*"). Therefore, the problem with vocabulary appeared to be twofold: insufficiency of enough words and retrieval of the vocabulary.

Thirdly, the issue of grammar anxiety has been found to be an important factor impacting the use of FL. Some students (possessing lower FL level) revealed that lack of grammatical knowledge such as not knowing grammar rules and the complexity of the tense system embarrassed them markedly when speaking English*: " <…> when you need to change tenses"," <…> the more I learn, the more I make grammar mistakes", "difficult as what tense to use" <…>; " <…> most problems are grammar problems*". Such examples witness that the respondents feel anxiety because they lack grammatical knowledge and this results in problems in making sentences correctly. Most respondents comprehended that the insufficiency of grammar knowledge and English words led to their inability to express themselves in a foreign language.

Moreover, pronunciation was accounted to be a big cause of FLA as well. Most students reported challenges in the comprehension stage, for instance, they pointed that they sometimes were unable to understand foreign people because of their accent *("<…> it's difficult because of unclear pronunciation of other people").* In addition, the respondents also struggled to not making mistakes when pronouncing words in class *("I feel fear of*

using not correct word or mispronounce it"). Typically, students make a conscious effort to speak English correctly, trying hard to avoid mistakes in the classroom setting. This sometimes makes them tense and uncomfortable.

One of the major concerns shared unanimously by the participants of the research in the classroom was their fear of speaking the language inaccurately. Only one student noted that she was afraid of making mistakes because of poor evaluation. A number of students reported fear and anxiety about their peers' reaction *("<…> speaking in front of audience"; " <...> when you speak to people who know English well"; " <...> situations where unknown people would laugh at your mistakes <...> ";" <…> when you speak and somebody listens to you <...> ";" bullying ").* Thus, the reported answers prove that the competitiveness exists among students and they also receive negative or humiliating reactions from their peers. Moreover, being corrected by the teacher or even other students seems to be one more source for FLA *("I am afraid of making mistakes as teachers or other students usually try to correct me").* However, one interviewee said that in his opinion making mistakes was normal.

Furthermore, according to the received data, fear of exams, tests or making mistakes result in negative educational outcomes for most students. The respondents reflected they were test or exam anxious *("I am anxious when my knowledge is evaluated"; "<…> situations when speaking or writing is evaluated").*

What is more, making mistakes, always reported as an obstacle in studying a foreign language, was perceived as a natural step towards development by some of the respondents *("I am afraid a little, but you must try not to make mistakes and learn from them"; "I am not afraid of mistakes and try not to repeat them"; "I am afraid of reactions of unknown people especially when you make mistakes"; "I am not afraid of mistakes or other people reactions"; "I am learning not to be afraid ").*

Moreover, the respondents' perception of their communication skills has been reported to be anxiety-breeding. *"Speaking is very difficult as I can understand many things but I cannot express my thoughts"*, - said one of the respondents. Most of the students believed that communication apprehension hindered their learning process and demotivated them *("Speaking on the spot, without preparation, is difficult"; "Public speaking is difficult"; "Learning by heart disturbs me").*

Besides the perceptions concerning the language-learning situation (required standard, teachers' expectations, peers' proficiency), perceptions of their own English language competence were found to be another important source of anxiety for the interviewed students. Eight of them expressed dissatisfaction with their L2 proficiency, particularly their speaking skills.

These findings suggest that facing their limitations in English and failure to live up to their own personal expectations and the expectations of the surrounding environment was a major source of anxiety for the interviewed students.

The teacher. The role of a teacher appeared to be significant in maintaining low level of language anxiety. The respondents reported that the teacher played a neutral role or decreased the level of anxiety in most cases *("<…> does not cause anxiety <…> "; " <…> plays neutral role <…> "; " <…> teacher reacts calm and controls the situation"; " <…> anxiety decreases when you talk only to teacher"; " <…> teacher decreases the level of my anxiety, helps and makes individual speaking tasks"; " <…> teacher decreases the level of anxiety").* The teacher, in their opinion, plays the biggest role of all. They think that it would be much worse without the teacher's assistance. The teacher is the person who encourages or suppresses students' confidence. So it is the teacher's role to create the atmosphere of comfort and fearlessness. One of the students said that teachers at school created the feeling of anxiety, but at the university they created the feeling of relaxation. As the teacher encouraged them to speak more and did not laugh at their mistakes this made the atmosphere at English university classes relaxing *("Every teacher of English was nice and not very strict, and that helped me"; "If the teacher is good and kind the lessons and the language itself become more interesting").*

How to reduce FLA in the learners? In line with the students' responses, the perception of the need for further individual development in language learning was identified by the respondents themselves. The interviewees showed their enthusiasm in eliminating mistakes, increasing vocabulary and realization of their tribute in language learning as well *("<…> ...relax and should have studied more at school <...> "; " <...> eliminate shortage of knowledge resulting from school activities"; " <...> try to learn harder <...> "; " <...> not to pay attention to others' reactions but to focus on your own mistakes").*

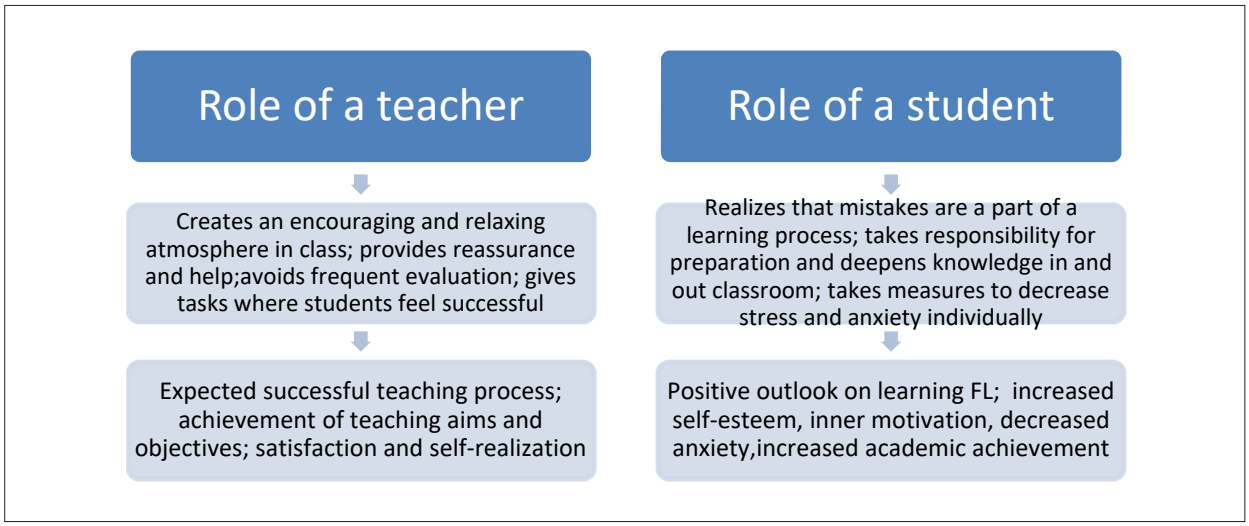

Figure. **Strategies for alleviating FLA as recommended by the respondents for successful university learning**

The opinions of the interviewed students on how to reduce FLA can be divided into two groups: a) the role of the teacher and b) the role of students themselves (Figure).

In order to reduce language anxiety in learners, students should be encouraged to speak more and especially encouraged speaking on the spot when students are unprepared for the task.

Teachers should not be strict; they should let students discuss not only professional topics but also about various life situations. Then English classes could become fun and without stress, not just like other classes. Teachers should also take into consideration that students may have different level of proficiency in English and not judge them equally *("Teachers should change their attitude that you already know this because you know the language, but not all of us have the same level of English").*

Teachers should make students believe that making mistakes is a part of the learning process. In the interviewed students' opinion big responsibility in learning a foreign language is on the students' shoulders. To give some comments: *"I have to speak as much as possible and learn more new words";"I have to try speak more slowly"; "I don't have to think what others may think about you and try thinking in English not in Lithuanian".*

In summary, the most important issues discussed above lead to demotivation and lowering of self-esteem as the respondents recognized themselves *("Knowing that you won't be able to do some tasks"; "I usually get confused and begin speaking in my native language"; " <…> when you still don't know things you had to learn at school"; " <…> not good preparation, little practice"; " <…> when I pay too much attention to my unsuccessful speech"; " <…> poor psychological attitude").* Perceptions of their own English language competence were found to be an important source of anxiety for the interviewed students. Nevertheless, the answers of the respondents suggested a rather positive attitude of anxious learners towards learning English. Most of the respondents perceived the necessity of trying to cope with stress and anxiety themselves. Moreover, the study found that the advanced-level students still experience moderate levels of FLA in their university English classes (fear of public speaking, fear of being misunderstood, fear of the effect of the mistakes made, fear of being laughed at by their peers, fear of looking stupid, etc.) . That is in line with the studies by Toth (2011) who found that more proficient students were more comprehensible about their limitations and mistakes in learning languages.

In addition, the study found that speaking English in the classroom was different and more anxiety provoking than communicating with their friends and family members outside the classroom.

What is more, a friendly, encouraging role of teachers appeared to be crucial in the university classroom setting. As the findings suggested, teachers should take into consideration that students may have different level of proficiency.

The remediation of FLA anxiety should encompass the corporate efforts of both students and teachers resulting in the reduction of the existing FLA and, thus, facilitation the process of foreign language learning.

DISCUSSION

The in-depth interviews revealed that foreign language anxiety continues to persistently exist due to: (1) insecurity and discomfort in class, (2) linguistic difficulties, such as lack of sufficient vocabulary, a poor command of grammar rules and pronunciation difficulties, cognitive challenges: fear of failure (failure in communication, failing in exams, making mistakes, failing in front of others), lack of self-esteem, (3) the role of the teacher, and (4) other reasons (competitiveness, lack of preparation).

What emerged from students' accounts of their current language learning experience is their positive attitude towards learning English. However, they felt insecure and uncomfortable in class sometimes. According to Hashemi (2011), the students usually blame strict class environment as being a potential threat to their success in class as well as meeting high standards of university education. Insecurity and discomfort are feelings accompanying FLA phenomenon. As outlined by Kayaoglu and Saglamel (2013), this phenomenon is usually followed by visible physical changes commonly re-occurring during lectures. Most of the learners reported that they had experienced psychological and physical changes, like trembling of hands, rapid heart beating, bad sleep, and blush. Some of them believe that even their behaviour changes when they suddenly start laughing at the lesson, they feel frightened, worried, excited, lost, disorientated, not self-confident and shameful.

Moreover, the most common linguistic difficulties reported by the students were the lack of vocabulary, the complex nature of English grammar, pronunciation and accent.

Most respondents comprehended that the insufficiency of English words leads to their inability to express themselves in a foreign language. As in the research by Toth (2011) who found that there was a gap between native and foreign languages the respondents also encountered challenges in translating because of the different structure of foreign and native languages.

The issue of grammar anxiety has been found to be an important factor impacting the use of FL. Some students revealed that lack of grammatical knowledge such as not knowing grammar rules and the complexity of the tense system embarrassed them markedly when speaking English.

Besides, pronunciation appeared to be a big cause of FLA as well. Most students reported challenges at the comprehension stage, for instance, they pointed that they sometimes were unable to understand foreign people because of their British accent. In addition, the respondents also struggled to not make mistakes when pronouncing words in class. This finding is in agreement with Riasati's (2011) study on FLA where the respondents also pointed that the speed of speech, intonation patterns and listening activities is becoming a problem for most students in FLA learning.

In line with the responses, cognitive challenges included failing in front of others, competitiveness, fear of exams, tests, making mistakes, evaluation, failure in communication and lack of self-esteem.

Firstly, the collected data revealed that students feel fear to fail especially in front of their peers. A number of students reported fear and anxiety about their peers' reaction. Thus, the reported answers prove that competitiveness exists among students and they also receive negative or humiliating reactions from their friends.

It is interesting to note that some respondents proved to be self-conscious and pointed that they did not pay attention to other students' reaction. Those students appeared to possess a higher level of English language (B2/C1). That is in line with the studies by Toth (2011) who found that more proficient students were more comprehensible about their limitations and mistakes in learning languages. Furthermore, according to the received data, fear of exams, tests or making mistakes result in negative educational outcomes for most students as well as making mistakes or receiving low evaluation were considered to be the major obstacles in studying a foreign language. Conversely, some subjects of the research reported that they were not afraid of making mistakes and considered that making mistakes is normal in the learning process.

Failure in communication has been reported to be anxiety-breeding by the respondents. The fear of communicating orally and public speaking anxiety has long been accepted as psychological phenomena. Hashemi (2001) noted that fear of giving a speech exceeded even such phobias as fear of snakes, elevators, and heights. Some participants of the present research noted that just knowing that they will have to speak in front of other people puzzles them and makes them nervous; especially when they have to speak on the spot, without preparation and lack of time for preparation has been reported to be one of additional factors causing learners' anxiety. Other students report that public speaking

is difficult as they cannot understand many things to express their thoughts. These findings are congruent with those of Riasati (2011) who argued that if students are not prepared enough for the activity, they feel anxious, which affects their performance. Thus, communication apprehension hindered their learning process and demotivated them.

One more source of foreign language anxiety is a teacher. Teacher-generated anxiety was documented in much earlier research done by another researcher, such as Price (1991). They reported significant teacher-generated anxiety and examined teacher-learner interactions. Williams & Andrade (2008) argued that teachers shoulder a greater responsibility nowadays. According to Kayaoglu and Saglamel (2013), the center of gravity in FL teaching/learning has been shifted because of the growing student autonomy. Now teaching has undoubtedly become student-centered. However, learners still attach a significant role to teachers and they look at the teacher as the key tool of success or failure. At the same time they fail to notice that the teacher is only one factor in all learning process.

The present research revealed quite positive attitude to the teacher's role in causing language learning anxiety. Some participants of the research noted that teachers in their language learning classes are good and very understanding. Teachers either take a neutral position or minimize tension and anxiety, thus, encouraging them to speak in English.

However, some of the research subjects are embarrassed by the teacher correcting their mistakes or even feel some pressure from teachers when they want too much from the person. The teacher's interference disturbs these learners: they can lose their thought and are not able to concentrate on the topic.

The participants of the present research believe that there are ways that could help to relieve stress and anxiety in language learning. This could be done *both* by teachers and students. The teachers can make a stress-free language learning environment in which students can learn the material confidently. With regard to factors that could reduce learning anxiety the participants of the present research mentioned more written assignments instead of oral, enough time for preparation, the same level of students' proficiency in the group, speaking to their peers but not to the teacher, no evaluation, more focus on the terminology in the field; etc.

Finally, the respondents of the study are of the opinion that students themselves can help relieve their anxiety so as to be more successful in foreign language learning. Students have to learn more independently and step aside their comfort zone. They have to prepare better for the lesson, attempt to develop their speaking skills, learn more words, watch films, TV in English and communicate with foreign people. Some of them also mention that the most important thing is to be self-confident and not to be afraid of making mistakes, thus increase their self-esteem and communication experience.

Consequently, the findings of the research are congruous with the opinion that only corporate efforts of all of them together can reduce the existing FLA and, thus, facilitate the process of foreign language learning.

Recommendations for further research. As foreign language anxiety gradually diminishes with increasing proficiency and experience, further research should focus on the comparison of low and higher level students' FLA in-class experiences and out-of-class settings (real life, communicating with professionals in the fiels abroad, self-study in foreign language, following sports career or pursuing active leisure activities). Moreover, the role of an instructor may be significant for further research as well. Thus, focus group analysis for the teachers' perceptions of students' FLA in class may be beneficial for the in-depth study of FLA in university education.

CONCLUSIONS

1. Awareness of the fact that FLA really exists and appears to be an obstacle for students' academic achievement needs to be acknowledged.
2. The analysis of a personality as well as eliminating possible hindrances or obstacles such as cognitive and linguistic problems while learning FLA are considered to be vital for progress.
3. Not only pedagogical or psychological methods are needed, but also collaboration rather than competition must be implemented as a tool in classes for further advancement in learning.
4. These measures might help to reinforce self-esteem and promote intrinsic motivation of students paying more attention to the building and reinforcing their personalities' development to achieve better results in the foreign language classroom and, thus, in the overall goal of studies in the student learning process leading to a successful career in future.

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Received on February 06, 2019
Accepted on March 05, 2019

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 34–41; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.777

HOW TO EFFECTIVELY BOOST FAT OXIDATION BY CALORIE RESTRICTION IN OVERWEIGHT AND OBESE ADULTS?

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ABSTRACT

Background. It is clinically important to determine the factors that increase fat oxidation and have potential to improve body composition in overweight and obese individuals. Thus, the aim of the present study was to compare the effects of a 2-day very low-calorie diet and 2-day zero-calorie diet on fat oxidation and prospective food consumption in overweight and mildly obese adults.

*Methods***.** Eighteen subjects (body mass index above 25 kg/m^2) aged 19–33 years were tested under two conditions allocated randomly: 2-day zero-calorie diet with water provided ad libitum and 2-day very-low calorie diet. Appetite sensations, mood state, inhibitory control, and substrate oxidation were evaluated before and after each diet.

Results. Greater increase in fat oxidation ($p < .05$) was observed after zero-calorie diet when compared to a very low-calorie diet. Results showed that both diets increased ($p < .05$) sensation of hunger and prospective food consumption, whereas no changes were observed in inhibitory control. Greater decrement for vigor ($p < .05$) was observed after zero-calorie diet when compared to a very low-calorie diet, whereas other mood states were not affected by it.

Conclusion. Intermittent fasting with zero-calorie diet may boost fat oxidation to a greater extent when compared to very low-calorie diet and may assist with weight loss in overweight and mildly obese adults.

Keywords: fasting, inhibitory control, mood, substrate oxidation very-low calorie diet.

INTRODUCTION

Interventions aimed at increasing fat metabolism could reduce the symptoms of metabolic diseases such as obesity and type 2 diabetes. Thus, it is clinically important to determine the factors that increase fat oxidation (Achten & Jeukendrup, 2004; Frisancho, 2003) and have potential to improve body composition in overweight and obese individuals. Different degrees of calorie restriction regimes are important determinants of fat oxidation. It is well established that increased ketosis can burn stored fat and to produce the energy needed by the body and brain (Anton et al., 2018; Cox & Clarke, 2017). Recently, 5:2 intermittent calorie restriction has been popularized, in which a very low-calorie diet or zero-calorie diet is allowed 2 days a week and "normal" eating is resumed on non-diet days (Anton et al., 2018; Longo & Mattson, 2014; Solianik & Sujeta, 2018; Solianik, Sujeta, & Čekanauskaitė, 2018; Solianik, Sujeta, Terentjevienė, & Skurvydas, 2016). Nevertheless, recent studies showed that low glucose level is replaced by ketones (Cunnane et al., 2011), and glucose availability depends on the degree of calorie restriction (Solianik & Sujeta, 2018; Solianik et al., 2018; Solianik et al., 2016), we are not aware of any previous studies of the comparison of a 2-day zero-calorie diet and 2-day very low calorie diet on fat oxidation.

It is noteworthy that successful weight loss depends on inhibitory control that is particularly important in the maintenance of obesity-related behaviors and potentially, differential response to interventions. Recent studies observed that poor

general inhibitory control is associated with reduced weight loss outcomes (Manasse et al., 2017). It was established that neither 2-day zero-calorie diet (Solianik & Sujeta, 2018), nor 2-day very low-calorie diet (Solianik et al., 2018) affected inhibitory control. However, dietary adherence might also be limited by perceived stress, mood and appetite sensation changes. Higher food intake in response to stress and negative emotions is an important factor of the weight regain of many dieters (Van Strien, 2018). Recent studies established that feelings of emptiness and hunger were associated with a dysphoric mood (Solianik et al., 2016; Hetherington et al., 2013). It was established that both very-low calorie diet and zero-calorie diet evoke moderate stress (Solianik & Sujeta, 2018; Solianik et al., 2018). However, only zero-calorie diet increases anger in amateur weight lifters (Solianik et al., 2016) and decreases the sensation of vigor in overweight women even before the start of the diet (Solianik & Sujeta, 2018). Interestingly, despite of increase in hunger after zero-calorie diet (Solianik & Sujeta, 2018; Solianik et al., 2016) and very low-calorie diet (Solianik et al., 2018), it can be expected that increased ketones after fasting may coincide decrease in hunger (White & Venkatesh, 2011).

Nevertheless, it can be expected that a zero-calorie diet has greater efficiency in fat oxidation compared to a very low-calorie diet. Yet, subjective responses, such as hunger, desire to eat and mood degradation, might limit further weight loss. Therefore, the main aim of present study was to compare the effects of a 2-day very low-calorie diet and zero-calorie diet on fat oxidation and prospective food consumption in overweight and mildly obese adults. Moreover, inhibitory control, perceived stress responses, mood state and appetite sensations, such as hunger and fullness, were also examined.

METHODS

Participants. Twenty-six volunteers were assessed for eligibility. The criteria for inclusion were: (1) overweight or mildly obese (BMI 25–35 kg/m^2) adults; (2) age 18–35 years; (3) nonsmokers; (4) not engaged in any weight reduction program; (5) no excessive sporting activities, i.e., ≤ 3 times per week; (6) no medications that could affect experimental variables; (7) no history of chronic disease. Pregnant or lactating women were excluded. In total, eighteen participants (8 men and 10 women) aged 26.4 ± 4.5 years met the inclusion criteria and agreed to participate in this study. Informed consent was obtained from all participants included in the study. All procedures were approved by the Kaunas Regional Biomedical Research Ethics Committee (No. BE-2-5) and were conducted in accordance with the Declaration of Helsinki.

Experimental protocol. We used a paired cross-over design, in which all participants participated in two experimental parts in a randomized order, at least 1 week apart. One week before the experiment, all participants were familiarized with the inhibitory control tasks. The participants were instructed to refrain from fatiguing work, and from ingesting alcoholic beverages, caffeine, and sedating antihistamines for at least 2 days before the experimental measurements.

All experimental measurements began at 8:00 a. m. The participant arrived at the laboratory after overnight fasting. Upon arrival at the laboratory, body weight was measured. The participant was then asked to rest and remain awake while lying supine for 20 min in a quiet room. Resting pulmonary gas exchange was recorded during the last 10 min. Subsequently, the participant rated current mood and appetite sensations, and a blood sample was obtained for measurement of glucose concentration. The participant was then seated at a table, and inhibitory control evaluating tasks were performed. The participant then rested 1 day before starting the 2-day very low-calorie diet (511 kcal/day) or the 2-day zero-calorie diet with water provided ad libitum as described previously (Solianik & Sujeta, 2018; Solianik et al., 2018; Solianik et al., 2016). Briefly, during the very low-calorie diet, commercially available instant oatmeal porridge (Activus, Kauno Grūdai, Kaunas, Lithuania) was packaged in 70.0 g (dry weight) packages, and two packages per day were provided to each participants for 2 days. Each package had a caloric content of 255.5 kcal. The composition of the oatmeal was 47.4 g carbohydrates (10.3 g sugars), 10.9 g protein, 3.8 g total fat (0.8 g saturated fat), 5.0 g dietary fibers, and 0.1 g salt. After both 2-day diets, the participant arrived at the laboratory after an overnight fast, and provided their subjective rating of perceived stress and repeated the experimental measurements in the same order as that described for the period before dieting.

Experimental measurements. The body weight and body mass index (BMI) were measured

using a body composition scale (model number TBF-300, Tanita, West Drayton, UK) while the participants were wearing only underwear.

Oxygen uptake (VO_2) and carbon dioxide production (VCO_2) were monitored every 5 s on a breath-by-breath basis using the mobile spirometry system (Oxycon Mobile, Jaeger/ VIASYS Healthcare, Hoechberg, Germany), which was calibrated following the manufacturer's instructions. Total carbohydrate (CHO) and fat oxidation (FO) rates were computed using the following non-protein stoichiometric equations (Péronnet & Massicotte, 1991): CHO = 4.585 × VCO_2 – 3.226 × VO_2, and FO = 1.695 × VO_2 – 1.701 × VCO_2. Respiratory exchange ratio (RER = VCO_2/VO_2) was also used to determine substrate oxidation.

Mood states were assessed using the Brunel Mood Scale containing 24 items (Terry, Lane, & Fogarty, 2003). The items are answered on a 5-point scale ranging from 0 (not at all) to 4 (extremely), and each subscale (i.e. anger, confusion, depression, fatigue, tension, and vigor), with four relevant items, can achieve a raw score in the range of 0 to 16.

Appetite sensations (hunger, fullness, prospective food consumption and desire to eat specific foods) were assessed on a visual analogue scale ranging from 0 ("I am not hungry at all/not at all full/nothing at all/very much") to 10 ("I have never been more hungry/totally full/a lot/not at all") on a 10-cm long horizontal line (Flint, Raben, Blundell, & Astrup, 2000). Perceived stress was also assessed on a visual analogue scale ranging from 0 ("no stress") to 100 ("the highest stress imaginable") (Solianik & Sujeta, 2018; Solianik et al., 2018).

The glucose concentrations were determined in capillary blood samples using a CardioChek PA analyzer (Polymer Technology Systems Inc, Indianapolis, IN, USA) via finger-prick test.

Inhibitory control was assessed using the computerized automated neuropsychological assessment metric Version 4 (Vista Life Sciences, Parker, CO, USA) (Reeves, Winter, Bleiberg, & Kane, 2007). During Go/No-Go task, the participant was instructed to respond as quickly as possible to a letter "x" on the screen by pressing the right button each time the stimulus appeared; when a letter "o" appeared, the participant was required to withhold his response. During Stroop task, the participant was instructed to respond as quickly as possible to the color used to print the color names on the screen by pressing an associated keyboard key (1 for "red", 2 for "green", and 3 for "blue"). On each trial, a word indicating a color name was presented on the screen in different color ink (i.e. red, green, or blue).

Statistical analysis. All values are presented as means ± standard deviations. A two-way repeated measures analysis of variance with two within-subject factors was used to analyze the effects of time (before vs. after) and diet (zero-calorie diet vs. very low-calorie diet) on all variables. If a significant effect of time, diet or time-diet interaction was found, the statistical power (SP) and the partial eta squared (η_P^2) were calculated as an indication of the magnitude of the observed effect. If a significant interaction of time × diet was observed, a paired t-test was used to identify the changes within each diet and to evaluate the differences between diets. The dependent-sample t-test was also used to determine differences in the perceived stress ratings between diets. The level of significance was set at $p < 0.05$. Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) software version 21.0 (IBM Corp., Armonk, NY, USA).

RESULTS

Anthropometry. The anthropometric parameters of the participants are reported in Table 1. Significant effects of time ($F_{1,17} = 169.27$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.91$ for weight and $F_{1,17} = 163.46$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.91$ for BMI) and the time × diet interaction ($F_{1,17} = 5.63$, $p = .030$, $SP = 0.61$, $\eta_P^2 = 0.25$ for weight and $F_{1,17} = 4.56$, $p = .048$, $SP = 0.52$, $\eta_P^2 = 0.21$ for BMI) were observed for anthropometric data. Participants in the zero-calorie diet and very low-calorie diet lost ($p < .001$) 2.2 ± 0.9 kg and 1.7 ± 0.8 kg of initial weight, and 0.7 ± 0.3 kg/m^2 and 0.5 ± 0.2 kg/m^2 of initial BMI, respectively. Greater decrement for weight ($p = .033$) and BMI ($p = .022$) was observed after zero-calorie diet when compared to very low-calorie diet.

Perceived stress and appetite sensations. The perceived stress during the zero-calorie diet and very low-calorie diet was rated as moderate (42.0 ± 19.3 and 39.7 ± 20.6, respectively); it did not differ between diets. The appetite sensations of the participants are reported in Table 2. Both diets decreased sensation of fullness ($F_{1,17} = 60.72$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.78$), and increased sensation of hunger ($F_{1,17} = 69.96$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.80$) and prospective food consumption ($F_{1,17} = 22.19$, $p < .001$, $SP = 0.99$, $\eta_P^2 = 0.57$). Participants indicated an increased desire to eat sweet ($F_{1,17} = 9.19$, $p = .008$,

SP = 0.82, η_P^2 = 0.35), salty ($F_{1,17}$ = 11.16, p = .004, *SP* = 0.88, η_P^2 = 0.40), and savory foods ($F_{1,17}$ = 18.26, p = .001, *SP* = 0.98, η_P^2 = 0.52). The significant time × diet interaction was observed only for fullness ($F_{1,17}$ = 5.49, p = .032, *SP* = 0.60, η_P^2 = 0.24). The zero-calorie diet and very low-calorie diet significantly decreased sensation of fullness (p < .003) 3.2 ± 2.2 and 1.4 ± 1.7 of initial sensation, respectively. Greater decrement for fullness (p = .002) was observed after zero-calorie diet when compared to very low-calorie diet.

Mood states. The mood states of the participants are reported in Table 3. The significant time × diet interaction was observed only for vigor ($F_{1,17}$ = 5.49, p = .038, *SP* = 0.60, η_P^2 = 0.24). The zero-calorie diet significantly decreased vigor (p = .040) 1.7 ± 3.2 of initial state, whereas this state remained unchanged during the very low-calorie diet. Greater decrement for vigor (p = .038) was observed after zero-calorie diet when compared to very low-calorie diet.

Table 1. **The effect of 2-day diets on the anthropometry**

	Zero-calorie diet				Very low-calorie diet				Effect of diet	Effect of time	Interaction effect of time × diet
	Before		After		Before		After				
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*			
Weight, kg	87.6	12.9	86.3	12.8	86.9	12.5	85.2	12.2	n. s.	p < .001	p = .030
BMI, kg/m²	27.7	2.3	27.0	2.2	27.5	2.2	26.9	2.2	n. s.	p < .001	p = .048

Notes. *SD,* standard deviation; BMI, body mass index; n. s., not significant (p > .05).

Table 2. **The effect of 2-day diets on the appetite sensations**

	Zero-calorie diet				Very low-calorie diet				Effect of diet	Effect of time	Interaction effect of time × diet
	Before		After		Before		After				
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*			
Hunger	3.9	2.4	7.3	2.3	4.0	2.3	6.2	2.0	n. s.	p < .001	n. s.
Fullness	3.9	2.3	0.8	0.9	3.8	1.4	2.4	1.6	n. s.	p < .001	p = .032
Prospective food consumption	5.8	1.9	7.7	1.5	5.6	1.9	6.9	1.7	n. s.	p < .001	n. s.
Desire to eat foods:											
Sweet	6.4	2.5	4.3	2.8	6.2	2.4	5.0	2.8	n. s.	p = .008	n. s.
Salty	6.4	2.2	4.1	2.5	6.1	2.3	4.5	2.5	n. s.	p = .004	n. s.
Savory	7.4	2.7	4.9	3.7	7.6	2.4	5.8	3.4	n. s.	p < .001	n. s.
Fatty	7.8	2.6	6.0	3.9	6.3	3.4	6.5	3.5	n. s.	n. s.	n. s.

Notes. SD, standard deviation; n. s., not significant (p > .05).

Table 3. **The effect of 2-day diets on the mood states**

	Zero-calorie diet				Very low-calorie diet				Effect of diet	Effect of time	Interaction effect of time × diet
	Before		After		Before		After				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
Anger	0.5	0.9	1.5	1.9	0.9	1.6	0.9	1.3	n. s.	n. s.	n. s.
Confusion	1.2	2.4	1.4	2.1	1.2	2.1	0.6	0.9	n. s.	n. s.	n. s.
Depression	0.6	1.5	1.3	1.9	1.3	2.2	1.0	1.5	n. s.	n. s.	n. s.
Fatigue	4.2	3.3	5.4	4.1	4.3	3.3	3.4	2.8	n. s.	n. s.	n. s.
Tension	1.6	1.8	1.6	1.5	1.2	1.4	1.3	1.7	n. s.	n. s.	n. s.
Vigor	8.6	1.9	6.9	3.5	7.2	3.2	7.9	3.3	n. s.	n. s.	p = .038

Notes. SD, standard deviation; n. s., not significant (p > .05).

Table 4. **The effect of 2-day diets on the inhibitory control**

	Zero-calorie diet				Very low-calorie diet				Effect of diet	Effect of time	Interaction effect of time × diet
	Before		After		Before		After				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
Go/No-Go task											
Reaction time, ms	334.5	21.5	336.4	24.6	340	26.3	334.9	16.7	n. s.	n. s.	n. s.
Accuracy, %	94.1	3.3	94.3	3.9	94.4	3.2	94.4	2.7	n. s.	n. s.	n. s.
Stroop task											
Reaction time, ms	590.5	93.3	585.3	109.7	584.5	108.1	581.7	109.5	n. s.	n. s.	n. s.
Accuracy, %	94.9	4.5	93.8	6.6	94.4	5.3	92.4	5.9	n. s.	n. s.	n. s.

Notes. *SD*, standard deviation; n. s., not significant ($p > .05$).

Table 5. **The effect of 2-day diets on the glucose level and substrate oxidation**

	Zero-calorie diet				Very low-calorie diet				Effect of diet	Effect of time	Interaction effect of time × diet
	Before		After		Before		After				
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*			
Glucose, mmol/l	5.3	0.5	4.2	0.5	5.4	0.5	5.0	0.5	$p < .001$	$p < .001$	$p = .009$
VO_2, l/min	0.25	0.04	0.27	0.05	0.26	0.05	0.25	0.05	n. s.	n. s.	$p = .024$
VCO_2, l/min	0.21	0.03	0.20	0.04	0.21	0.04	0.19	0.04	n. s.	$p = .003$	n. s.
RER	0.84	0.08	0.71	0.03	0.81	0.04	0.74	0.02	n. s.	$p < .001$	$p = .008$
CHO, g/min	0.16	0.09	0.02	0.04	0.14	0.05	0.05	0.04	n. s.	$p < .001$	$p = .012$
FO, g/min	0.07	0.04	0.13	0.02	0.08	0.02	0.11	0.02	n. s.	$p < .001$	$p < .001$

Notes. *SD*, standard deviation; VO_2, oxygen uptake; VCO_2, carbon dioxide production; CHO, carbohydrate oxidation; FO, fat oxidation; n. s., not significant ($p > .05$).

Inhibitory control. Data of inhibitory control requiring tasks are reported in Table 4. There was no significant effect of time and diet, or the time × diet interaction on the inhibitory control.

Glucose level. Data of glucose level are reported in Table 5. Significant effect of time ($F_{1,17} = 21.98$, $p < .001$, $SP = 0.99$, $\eta_P^2 = 0.61$), diet ($F_{1,17} = 58.93$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.81$), and time × diet interaction ($F_{1,17} = 9.35$, $p = .009$, $SP = 0.81$, $\eta_P^2 = 0.40$) was observed for glucose level. Both diets significantly increased glucose level ($p < .001$). A greater glucose level was observed after the very low-calorie diet compared to zero-calorie diet.

Substrate oxidation. Data of substrate oxidation are reported in Table 5. Significant effect of time ($F_{1,17} = 85.26$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.83$ for RER, $F_{1,17} = 93.80$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.85$ for CHO and $F_{1,17} = 93.51$, $p < .001$, $SP = 1.00$, $\eta_P^2 = 0.85$ for FO) and time × diet interaction ($F_{1,17} = 9.00$, $p = .008$, $SP = 0.81$, $\eta_P^2 = 0.35$ for RER, $F_{1,17} = 7.96$, $p = .012$, $SP = 0.76$, $\eta_P^2 = 0.32$ for CHO and $F_{1,17} = 14.99$, $p < .001$, $SP = 0.95$, $\eta_P^2 = 0.47$ for FO) was observed for substrate oxidation. Both diets significantly increased FO ($p < .001$), and decreased RER ($p < .001$) and CHO ($p < .001$). A greater FO, and lower RER and CHO were observed after the zero-calorie diet compared to very low-calorie diet.

DISCUSSION

The aim of the present study was to compare the effects of a 2-day different degree calorie restriction on fat oxidation and dietary adherence in overweight and mildly obese adults. Vigor decreased only after zero-calorie diet, while the effect on other mood states, perceived stress, hunger and inhibitory control did not differ between diets, causing similar responses on prospective food consumption and desire to eat specific foods. Fat oxidation increased

after both diets; however, the increase was greater after zero-calorie diet.

Substrate oxidation. In accordance with previous studies (Clayton, Creese, Skidmore, Stensel, & James, 2016; Horton & Hill, 2001; Weyer, Vozarova, Ravussin, & Tataranni, 2001; Zinker, Britz, & Brooks, 1990), we have established that zero-calorie diet and very low-calorie diet increase fat oxidation (i.e. increase FO and decrease RER (i.e. the RER was close to 0.7 indicating that mainly fat was metabolized (Frisancho, 2003)) and decrease carbohydrate oxidation. As expected, greater fat oxidation was observed after zero-calorie diet. It is well established that with the inadequate availability of carbohydrates, the metabolism shifts from lipid/cholesterol synthesis and fat storage to mobilization of fat in the form of fatty acid and fatty acid-derived ketones, which provides energy to the body and the brain (Anton et al., 2018; Gupta et al., 2017). Thus it can be expected, that lower availability of energy during fasting state, caused greater fat oxidation during zero-calorie diet rather than very low-calorie diet.

Appetite sensations. It is suggested that stress can cause changes in appetite sensation (Farr, Li, & Mantzoros, 2016). In the current study, both diets evoked similar moderate stress. As expected, both diets increased hunger and decreased fullness. Even though fullness was lower after zero-calorie diet, no differences were observed in hunger sensation between zero-calorie diet and very-low-calorie diet. It is well established that low glucose level is replaced by ketones (Cunnane et al., 2011), and ketones may suppress hunger sensation (White & Venkatesh, 2011). In the current study, lower glucose level was observed after-zero calorie diet when compared to very-low calorie diet. Thus, it might be expected that greater ketones increase masked increase in hunger after zero-calorie diet. Furthermore, similar increase in hunger after both diets coincides with similar prospective food consumption and desire to eat specific foods.

Mood states. It was established that depressive symptoms and anger are related to overeating and binge eating behavior (Skinner, Haines, Austin, & Field, 2012; Zeeck, Stelzer, Linster, Joos, & Hartmann, 2011). However, in accordance with previous studies (Solianik & Sujeta, 2018; Solianik et al., 2018), only the zero-calorie diet decreased sensation of vigor in overweight and obese adults, whereas other mood states were not affected by it. In contrast, in previous study of Solianik et al. (2016), total calorie deprivation increased anger in amateur weight lifters. It was well established that resistance exercises increase testosterone level (Kraemer et al., 1999; Nindl et al., 2001), which may explain increased anger (O'Connor, Archer, & Wu, 2004; Solianik et al., 2016) in weight lifters but not in overweight and mildly obese adults.

Inhibitory control. It was demonstrated that poorer inhibitory control causes overeating and temptation to eat tasty and high caloric food, which is associated with future weight gain and decreased capacity to maintain weight loss (Ziauddeen, Alonso-Alonso, Hill, Kelley, & Khan, 2015; Nederkoorn, Jansen, Mulkens, & Jansen, 2007). In accordance with previous studies (Solianik & Sujeta, 2018; Solianik et al., 2018), very low-calorie diet and zero-calorie diet had no effect on inhibitory control in overweight and obese adults.

Limitations. Firstly, it should be noted that our subjects were overweight and mildly obese young-adults. Thus, the findings associated with the 2-day diets cannot be applied to other populations, such as children, older adults, lean or severely obese subjects. Secondly, the study was limited by the use of VAS for measurement of prospective food consumption and evaluation of lost weight at the end of both diets. Future studies should investigate maintenance of lost weight and estimate calorie intake after both diets.

CONCLUSIONS

Together, these findings suggest that effort to maintain weight losses are unlikely to be different between zero-calorie diet and very-low calorie diet, given current data of inhibitory control, emotional state, and appetite sensations. However, fat oxidation as a factor responsible for weight loss was greater after zero-calorie diet. Thus, intermittent fasting with zero-calorie diet may boost fat oxidation to a greater extent when compared to very low-calorie diet and assist with weight loss in overweight and mildly obese adults. Future studies should aim to compare chronic effects of different degree calorie restriction diets on weight loss-related indicators.

Acknowledgments. We thank joint-stock company Kauno Grūdai for supply of the food.

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Received on March 17, 2019
Accepted on March 22, 2019

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BALTIC JOURNAL OF SPORT & HEALTH SCIENCES
No. 1(112); 2019; 42–49; ISSN 2351-6496 / eISSN 2538-8347
DOI: 10.33607/bjshs.v112i1.778

ACUTE PSYCHOLOGICAL EFFECTS OF AIKIDO TRAINING

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ABSTRACT

Background. Aikido is a philosophy and an Eastern martial-art which is conjectured to have many positive effects on mind and body. At this time there is limited, but growing research on this topic. The objective of the current work was to examine for the first time the hypothesis that aikido training, like many other western forms of organized physical activities, has acute psychological benefits as manifested via favourable changes in affect and the flow experience.

Methods. Aikidokas (N = 53) took part in an *in-situ* investigation in which they completed the Positive Affect Negative Affect Schedule (PANAS) on at least three different occasions before and after their practice. They also completed a flow questionnaire at least on three occasions after their practice.

Results. The results indicated that positive affect increased, and negative affect decreased ($p < .001$) from pre- to post-practice. Aikidokas reported flow experience that on the average was not greater than that reported for other exercises; however it was greater than that reported after video-sport games. The reported flow was independent of the magnitude of change in positive and/or negative affect. The more experienced aikidokas experienced greater skill-challenge harmony, but not oneness with the experience, which are two constructs in flow, than less experienced practitioners.

Conclusion. These findings reveal relatively clearly for the very first time in the literature that aikido practice has acute, or immediate, psychological benefits akin to other martial arts and exercises.

Keywords: affect; budo; flow; martial art; zen.

INTRODUCTION

Epidemiological studies show that physical activity, in general, has numerous health benefits (Lee et al., 2011; Miller et al., 2016). In addition to physical health benefits, habitual physical activity has positive impact on people's psychological health as well (Acevedo, 2012). Most forms of planned physical activities trigger immediate psychological benefits as demonstrated in studies with aerobic dancers (Rokka, Mavridis, & Kouli, 2010), cyclists (Petruzzello, Snook, Gliottoni, & Motl, 2009), hatha yoga- (Lavey et al., 2005; West, Otte, Geher, Johnson, & Mohr, 2004), and Bikram yoga practitioners (Szabo, Nikházy, Tihanyi, & Boros, 2016), shadowboxers (Li & Yin, 2008), swimmers (Szabo et al., 2018; Valentine & Evans, 2001), walkers (Dasilva et al., 2011) and Nordic walkers (Stark, Schöny, & Kopp, 2012), runners (Szabo & Ábrahám, 2013), spinners (Szabo, Gáspár, Kiss, & Radványi, 2015) and possibly other exercisers.

Martial arts are organized forms of movements geared primarily towards various forms of soft and hard self-defence while also being a form of physical activity. Bowman (2017) argues against the reductionist definitions of martial arts referring to their uniqueness in philosophy, orientation, and movement. These activities also yield psychological benefits. Indeed, positive changes due to martial arts training were reported in tea-kwon-do (Toskovic, 2001) and tai-chi (Wang et al., 2010). However,

Foster (1997) found that while karate training lowered trait anxiety, no changes were observed after aikido training in measures of self-esteem, anxiety, and anger expression.

Aikido is a martial art originating from Japan around the beginning of the twentieth century; it is practiced in 130 nations around the world. Its founder was Morihei Ueshiba who developed it after studying extensively numerous combat systems, both armed and unarmed. Aikido is a means of fighting for self-defence embedding the philosophy to "improve one's character according to the rules of nature" (Aikikai Foundation, 2018). Its meaning can be summarized as "the way of Spiritual Harmony", where "Ai" means harmony, connection, "Ki" means spirit, life or cosmic energy, and "Do" is a method, the pathway (Szabolcs, Köteles, & Szabo, 2017). The practice of aikido is typically performed in pairs, with the aim to defend oneself without hurting the attacker, while creating a harmony in movement (to date no competitions are held in aikido). It is practiced through blending with the motion of the attacker and redirecting the energy of the attack by decentralizing the body in a controlled and relaxed way, with heightened state of awareness, employing circular and spherical movements (Stevens, 2001). Aikido is a parallel practice of mindfulness (Lukoff & Strozzi-Heckler, 2017) that is associated with the flow experience (Cathcart, McGregor, & Groundwater, 2014).

As most Japanese martial arts, aikido is founded on the philosophy of "ichi-go ichi-e" (like in English the "here and now", but more precisely translated as "one time, one chance"). This thought conveys a state of full absorption into the action. The martial artist must only focus (and concentrate deeply) on the here and now throughout the practice. This absorption into the practice is best achieved when one's skill matches the challenge and/or experience (Moneta, 2012) and culminates when both the skill and challenge are high, resulting in unison or oneness with the experience (Csikszentmihalyi, 1997). Therefore, highly skilled aikido practitioners could be expected to experience more flow than their less experienced counterparts, which is a conjecture that only received tentative support in the literature (Reguli, Čihounková, & Sebera, 2014) and, hence, begs for more research in the field.

While several psychological health effects of aikido could be expected from its practice based on its movement complexity involving balance, energy, force, endurance and harmony, empirical evidence for its acute mental benefits is almost lacking. Two studies that examined the immediate or acute psychological effects of aikido training projected negative findings. For example, in an early study, aikido practice did not decrease Type A behaviour in contrast to control participants or aerobic exercise practitioners (Jasnoski, Cordray, Houston, & Osness, 1987). In a later investigation, Delva-Tauiliili (1995) employing a pre-/post-training design found no changes in aggressive behaviour and self-control attributable to aikido training. However, these two studies focused on pathological states. Concerning healthy individuals, while numerous studies and reviews examined the acute psychological effects of a single bout of exercise (Basso & Suzuki, 2017), such research was not conducted to date with aikido practitioners. Based on the very limited findings projecting negative results on some psychological measures after aikido training, research enthusiasm seems to dampen since no reports were published on the immediate psychological benefits of aikido training in the new millennium. However, based on its philosophy and movement linked to flow, instant psychological benefits of aikido training may be expected to occur, in the affective states for example, similarly like in tai-chi (Wang et al., 2010). Pleasant psychological feelings after training, in general, fuel motivation and affinity for the activity as based on the competence motivation theory (Elliot, Dweck, & Yeager, 2017). However, the acute psychological effects of aikido training were not tested to date.

The objective of the current *in-situ* research was to assess the aikido training-induced changes in positive- and negative affect by assessing the subjective ratings of these measures after several, but a minimum of three, aikido training sessions. First, we hypothesized that the average rating of positive affect will be greater - while that of negative affect will be lower - after than before training (baseline). Second, we conjectured that aikido practitioners will experience flow, manifested in balance between skill and challenge and oneness with the movement during practice (Csikszentmihalyi, 1997). Third, based on Reguli et al.'s (2014) tentative findings we hypothesized that the experienced aikidoka will exhibit greater change in affect and report more flow experience than less experienced practitioners.

METHODS

Participants. Participants were adults (N = 53, age = 37.2 ± 10.56 years, range 18–57, 85% males) practicing aikido as a recreational activity on a regular basis. Actual frequency of aikido practice with respect to the last 3 months was 2.2 ± 0.77 bouts/week. Concerning aikido experience, 52% of participants ranked below the black belt, and 48% wore a black belt (i.e. 1st *dan* or above). Participants were recruited in aikido clubs of the Aikido Foundation in the Budapest metropolitan area. All the participants signed an informed consent form before participation. The study was conducted with the approval of the Research Ethics Board of the Faculty of Education and Psychology at ELTE Eötvös Loránd University in Budapest.

Measures. The Positive Affect Negative Affect Scale (PANAS – Watson, Clark, & Tellegen, 1988) was used for the assessment of affect at various intervals in the study. In the current work we adopted the 10-item psychometrically validated Hungarian version of this instrument (PANAS-HU; Gyollai, Simor, Köteles, & Demetrovics, 2011). The scale is comprised of 5 positive items (i.e., *alert, active*) and 5 negative items (i.e., *nervous, upset*). Each item is rated on a 5-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*very much*). An aggregate score is then obtained for both positive- and negative items. The PANAS has a long history of excellent psychometric properties (Ostir, Smith, Smith, & Ottenbacher, 2005; Watson & Clark, 1999). The internal reliability of the scale in the current study was α = 0.857 and 0.853 (before and after practice) for positive scale items and α = .677 and .674 (before and after practice) for negative scale items.

The 20-item Hungarian Flow State Questionnaire (FSQ; Magyaródi, Nagy, Soltész, Mózes, & Oláh, 2013) measures the intensity of the recently experienced flow state on a 5-point Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*very much characteristic of me*). The FSQ was derived from several versions of the Flow State Scale (Jackson, Eklund, & Martin, 2010). The instrument has two subscales. One of the subscales measures the skill-challenge harmony and the other gauges oneness with the experience. The internal consistency (Cronbach α) of the scale in the current study was α = .892 for the skill-challenge harmony subscale and α = .733 for the oneness with the experience subscale.

Procedure. Participants were informed that the goal of the research was the measurement of changes in mood during aikido training bouts. Before starting the training, participants were asked to complete the 10-item PANAS. Following the training, they completed the PANAS and the FSQ. At least three assessments (maximum 9, altogether 257 recordings, mean = 4.85, SD = 1.703) were obtained from each participant.

Statistical analyses. All statistical calculations were performed with the Statistical Package for Social Sciences (IBM SPSS, v. 25. IBM Corp., 2017). The mean values of the assessments on different occasions were calculated for the dependent measures for each participant. First a nonparametric test, that is less stringent on the sample size than its parametric equivalent (Pett, 2015), was adopted to examine whether there were differences between men and women in any of the dependent measures. Since based on the results of the Shapiro-Wilk test the assumption of normality in the data obtained for negative affect was violated, the more conservative Wilcoxon Signed-Rank test was applied for testing the changes in both positive- and negative affect, which also eliminated the concern about the regression toward the mean. Since the Shapiro–Wilk test was statistically not significant for the flow data, the hypothesis that aikido training is associated with flow was tested with one-sample t-test. A regression analysis was used the verify the predicting power of changes in positive-/negative affect on the flow experience. Finally, Mann–Whitney U tests were used to examine the differences in the dependent measures between less experienced and more experienced aikido practitioners.

RESULTS

Independent samples Mann–Whitney U tests indicated that men and women did not differ in positive- and negative affect before or after the training ($p > .05$), nor did they differ in the two flow variables that were assessed after the training ($p > .05$). Therefore, the full data-set, obtained from both men and women, was included in all the subsequent analyses. Descriptive statistics are presented in Table.

Wilcoxon Signed-Rank tests indicated that positive affect ratings were greater after the aikido training (mean rank = 29.11, *Mdn* = 18.67) than before the training (mean rank = 18.53, *Mdn* =

Dependent measures	M	SD	Mdn	% Regression to the mean (100[1-*r*]) *Pre-Post Measures*
Positive affect before practice	17.09	2.729	17.33*	33.4
Positive affect after practice	18.39	2.947	18.67	
Negative affect before practice	6.10	1.556	5.38*	15.6
Negative affect after practice	5.54	1.156	5.00	
Flow: skill-challenge harmony	37.65	5.74	37.6	N/A
Flow: oneness with the experience	36.91	3.72	37.0	

Table. **Means, standard deviations and medians of the assessed variables, also indicating the percent regression to the mean between the repeated measures**

Note. *Statistically significant from the after-practice value (Wilcoxon Signed-Rank test, $p < .001$).

17.33) $Z = -3.61$, $p < .001$ and the effect size (r) was .50, while the rating of negative affect were lower after training (mean rank = 17.67, *Mdn* = 5.00) than before the training (mean rank = 10.33, *Mdn* = 5.38), $Z = -4.46$, $p < .001$, $r = .61$. Both effect sizes were large (Rosenthal, 1994).

Since the Shapiro-Wilk test was not significant for the flow data, first a one-sample t-test was used to determine whether aikido practitioners reported experiencing flow above the median value of the FSQ scale after their training. This test was statistically significant for both, skill-challenge harmony (t [52] = 9.70, $p < .001$, 95% C.I. of the mean difference = 6.07–9.24, effect size [Cohen's d] = 1.33) and oneness with the experience (t [52] = 13.53, $p < .001$, 95% C.I. of the mean difference = 5.88–7.93, $d = 1.86$). Subsequently, we compared the mean values of the aikido practitioners with those reported earlier by Magyaródi et al. (2013) for video-sport games players. The test was again statistically significant for both, skill-challenge harmony (t [52] = 10.80, $p < .001$, 95% C.I. of the mean difference = 6.93–10.10, effect size $d = 1.48$) and oneness with the experience (t [52] = 21.70, $p < .001$, 95% C.I. of the mean difference = 10.0–12.10, $d = 2.98$). Finally, we also compared the participants' flow experience reported after aikido training with those reported by university students after aerobic exercise and spinning exercise (Szabo, 2018). After adjusting the alpha probability level with the Bonferroni correction for multiple tests, the one sample t-tests yielded no statistically significant differences neither in skill-challenge harmony nor in oneness with the experience between the means of aikido practitioners, aerobic- and spinning exercisers ($p > .05$; refer to Figure).

Subsequently, we calculated a total flow value by adding the scores obtained on the two subscales of the FSQ and the difference (change or delta [Δ]) scores for both positive- and negative affect by subtracting the post-aikido training scores from the baseline values obtained before the training. We

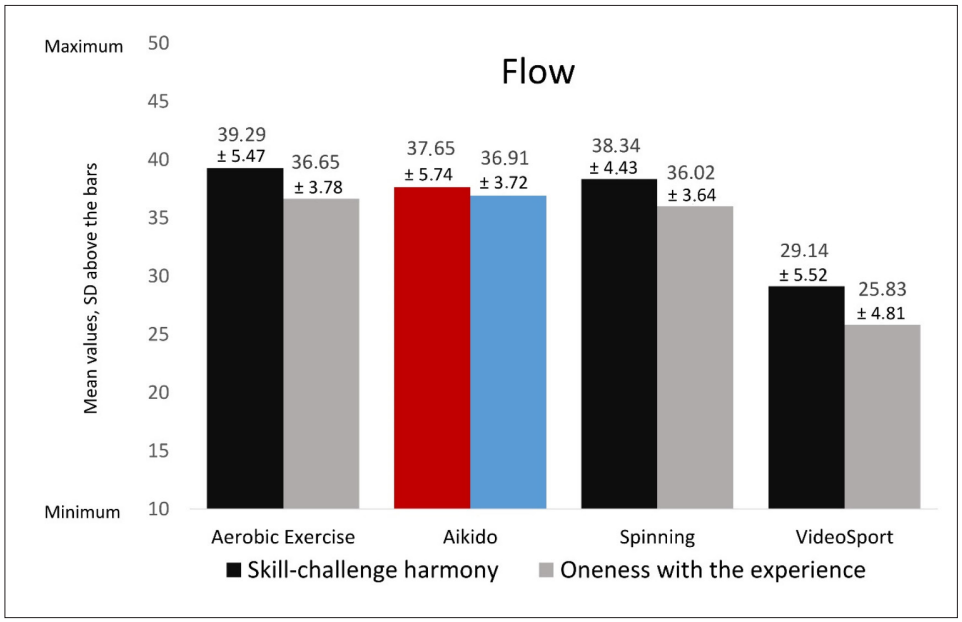

Figure. **Comparison of the flow experiences after three physical activities and video-sport games**

Note. The flow experiences reported in the current study are presented in colour and the means and the standard deviations appear above the bars. The aikido practitioners differed in both flow experiences from the video-sport game players, but not from aerobic- or spinning exercisers.

then examined the predictive power of the change scores, in both positive and negative affect, on the subjectively reported flow. The regression equation was statistically not significant ($p > .05$) as also reflected by the small R^2 value (.02) accounting for merely 2.0% of the shared variance between the magnitude of change in affect and the flow experience.

Finally, we tested the hypothesis that more experienced aikidoka will exhibit more favourable changes in affect and greater flow than less experienced practitioners by using a median split between the belt (reflecting experience) levels. While dichotomization is often criticized in the literature, the method is adequate (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015) and serves well this purpose. Scores falling right on the median value were excluded from the dichotomization. Hypothesized differences in change scores in positive- and negative affect and reported flow between the two groups were compared with Mann-Whitney U tests. These tests revealed that the more experienced aikidoka scored higher on skill-challenge harmony ($Z = –2.27$, $p = .023$, effect size ETA squared based on McCall's (2018) Formula 5.15 ($\eta^2 = Z^2 / n = 0.10$ [0.0972]). There were no other statistically significant differences between the two groups.

DISCUSSION

The current research provides three new findings to the extant literature. First is that aikido training results in increased positive affect and decreased negative affect after training and, therefore, has an acute psychological benefit. The second is that a bout of aikido training is associated with flow experience comparable to other forms of physical activities that is greater than the flow reported after video-sport games. The third is that the subjective flow experience after aikido training is relatively independent of the favourable changes in the affective states resulting from aikido training. The study also expands a previous finding (Reguli et al., 2014) that experienced aikido practitioners may exhibit greater flow than their less experienced counterparts.

The finding that aikido training results in increased positive affect and decreased negative affect immediately after training, compared to a baseline before the training, is in accord with past research in other physical activities (i.e., Bikram yoga (Szabo et al., 2016); leisure swimming (Szabo et al., 2018); spinning (Szabo et al., 2015)). The changes were large as based on the effect sizes ($r = 0.5$ and 0.6, respectively, which correspond to Cohen's d values > 1.0; Rosenthal, 1994) indicating that although anticipation of an intervention (in this case the training) may affect the baseline (Calvo, Szabo, & Capafons, 1996), aikido still has a prominent effect on improving affect. Indeed, an issue and dilemma in pre- and post-intervention designs concerns the validity of the baseline immediately before the intervention because it may be contaminated by anticipation effects (Calvo et al., 1996). Accordingly, an inflated positive- and a deflated negative affect baseline could yield lower changes attributable to the intervention (in this case aikido training) than a true baseline taken – for example – in the morning after awakening the day before the research. Consequently, the actual change *vis-a-vis* a true baseline (unaffected by anticipation) could be expected to yield even more robust results than those observed in the current study, which were nevertheless very large already.

The current findings also demonstrate that aikido practitioners experience flow, in terms of skill-challenge harmony and oneness with the experience, during the aikido training. These findings are based on retrospective assessment, but there is no other option because flow would be interrupted due to distraction in any attempt of simultaneous measurement while the participant is engaged in an activity. The results also indicate that the reported flow is not related to the favorable changes in affect because the shared variance was merely around two percent (2%) between the magnitude of changes in positive- and negative affect and the reported flow experience. This finding also suggests that affect and flow are rather unrelated constructs. Despite the philosophical and spiritual nature of the aikido (Szabolcs et al., 2017) and the parallel drawn to the practice of mindfulness (Lukoff et al., 2017), the aikidoka did not report greater flow values on either subscale of the FSQ than aerobic- or spinning exercisers even though the data for the latter is based on relatively few observations (Szabo, 2018). This novel finding suggests that exercise in general triggers high skill-challenge harmony and oneness with the experience that may be independent of the philosophical antecedent of the activity. However, in different context of sport, like vide-sports dominated primarily by cognitive elements, flow is lower

than in tasks involving both somatic and cognitive constructs. Although, this argument warrants future research the difference observed between aikido practitioners and video-sport (snowboard and tennis) players may rather be attributed to personal choice and past experiences. In the study by Magyaródi et al. (2013) university students were presented with tasks that were not self-selected and probably most participants had no previous experience with them. In these circumstances it is more difficult to achieve flow than in aikido or other self-selected and regularly practiced physical activities, which is also conveyed by the results presented in Figure.

Our results lend support to the preliminary findings reported by Reguli et al. (2014), who provided tentative evidence for higher flow-experience at higher levels of aikido practice. However, differences emerged in skill-challenge harmony only but not in oneness with the experience. This new finding indicates that even at lower belt levels aikidoka can be highly absorbed in the experience while their skill-challenge harmony is self-evaluated to be lower than in the more experienced aikidoka, which is an expectable result directly linked to the appraised level of mastery essential in flow (Chen, 2007). Like the oneness with the experience, the magnitude of the changes in affect from pre- to post-training did not differ between the groups, reinforcing the affective benefits of aikido training at any level.

Limitations and strengths. The current sample may not be representative. Although no differences were found between men and women in any of the measures, a study with a larger sample size and more balanced female/male ratio is advised. The cultural homogeneity (Hungarians) of the aikidoka restricts generalizability across nations, but it should stimulate research in this context. Like in all pre- to post-intervention designs the adoption of a baseline before the intervention may be affected by anticipation effects, therefore future studies should employ a true baseline that can be assumed to be unaffected by the upcoming intervention. One noteworthy strength of the study is that it was conducted *in-situ*, which is in the aikidoka natural practice environment without modifying the circumstance of the training, which increases the external validity of the results. Another strength of the study is that its results are based on several assessments (at least three), which increases the reliability of the results. It should be noted that almost all pre- post-intervention studies, examining the psychological changes attributable to exercise, were based on singe before- and after-exercise assessments.

CONCLUSIONS

The current study reveals that aikido training triggers increases in positive affect and decreases in negative affect. These effects are large as based on the obtained effect sizes. These results are based on several (at least three) assessments before and after *in-situ* (real-life situation) aikido practice, thus they bear high external validity. Similarly, the average of several assessments indicates that aikidoka experience flow during practice the magnitude of which is not different from that reported in other forms of physical activities, such as aerobic- or spinning exercise. However, the flow experienced by the aikidoka is larger than the amount of flow reported after video-sport games. The subjectively experienced flow in aikido is independent of the magnitude of changes in positive- or negative affect. More experienced aikidoka experience greater skill-challenge harmony than less experienced martial artists, but the latter group reports as much absorption into the practice, via oneness with experience, as the more advanced aikido practitioners. These results, although preliminary, provide support for the acute psychological benefits of aikido and agree with the bulk of the results reported for other forms of physical activities.

Conflict of interest. The authors have no conflict of interest to declare.

Financial disclosure. This research was supported by the Hungarian National Scientific Research Fund [K 124132].

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Received on Decmber 23, 2018
Accepted on February 21, 2019

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