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Creativity, Resistance to Mental Fatigue and Coping Strategies in Junior Women Handball Players

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Abstract

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The purpose of this study was to examine the existing correlations between creativity, which is expressed through fluency (wealth of ideas generated in a certain timeframe) and mental flexibility (in contrast with the rigidity of thinking), the resistance to mental fatigue and the coping modalities. To investigate the research issues, the following methods were used: observation, conversation and tests - Imagination and Creativity test, Resistance to Mental Fatigue (RNE) test and the COPE Survey (Coping strategies). The study comprised 11 junior female handball players, aged between 16-17 years. In our study, we used the Spearman correlation, which revealed important relations between the results obtained by the female athletes for creativity - expressed through fluency, as well as for the resistance to disruptive factors, the performance coefficient and the scores obtained by the female players for: planning, looking for instrumental support, looking for emotional support, positive reinterpretation and emotional discharge. The result analysis indicates a positively significant correlation between creativity - fluency and the scores obtained for positive reinterpretation, as a coping strategy, also a positively significant correlation between the performance coefficient and planning, as a coping modality, and negatively significant correlations between the resistance to disruptive factors and the following coping strategies: looking for instrumental support, looking for emotional support and emotional discharge. The results underline that the improvement of the resistance to disruptive factors, of the performance coefficient and of the fluency may have a positive impact on the coping strategies used by the athletes to overcome stressful situations.

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Keywords: Creativity; mental fatigue; coping strategy; handball.

1. Introduction

Handball is a competitive sport, its great sight being given by the dynamic game with frequent, unexpected changes of situations (Negulescu, 1998: 14). There are studies (Bar-eli, Tenenbaum, & Elbaz, 1990) which reveal that the handball players are vulnerable to a psychological performance crisis (a state in which one is expected to perform a task under physical and psychological arousal



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accompanied by anxiety), in the case of unexpected behaviours and unfair unexpected sanctioned behaviours. Thus, we emphasize the importance of developing adaptive coping strategies.

The “coping” concept designates all the mechanisms and behaviours that an individual builds between him/her and the situation perceived as threatening, in order to dominate, control, tolerate and reduce harmful impact that it might have on his/her physical or mental state. Coping implies complex, multidimensional control strategies to modify the situation which generates stress or the subjective perception, the internal echo of that situation. Coping strategies also require active processes and mechanisms used by a person with the purpose to reduce the negative tensions and to regain wellness and mental control or to avoid the stress (Tüdös & Mitrache, 2011: 105). The choice of coping solutions was found by research studies (Törestad, Magnusson, & Oláh, 1990) to be dependent on the perceived level of anxiety, perceived behaviour and perceived predictive control. Furthermore, research also highlights that coping with a stressful situation is a process; it is a transaction between a person and an event that plays across time and changing circumstances, with the relevance of a coping reaction varying with the phase of the stressful event (Zeidner, 1995). Creativity represents the ability to generate original and efficient assemblages, starting from pre-existing elements (Jaoui, 1990: 70). A creative person sees the same things as anybody else, but thinks of something different. The major components of creativity, identified by Guilford, are originality, mental flexibility and fluency (Brennan, 1983). The capacity to provide unique and rare responses to stimuli is originality. Mental flexibility identifies an ability to make shifts in thinking, to change the categories of response, while fluency represents the facility to generate information based on what is in an individual’s memory store. Mental flexibility is the opposite of fixity or rigidity in thinking, while fluency refers to the wealth of ideas, associations (Roco, 2004: 210). Current theoretical approaches regarding the creativity development support the view that gathering diversified experience over the years is an ideal environment for creative thinking. Thus, in sport, it was found that more creative players accumulated more time – time spent in unstructured play activities and time spent in training for their main sport – than their less creative counterparts (Memmert, Baker, & Bertsch, 2010). The simple reaction time to stimuli and vigilance are used in order to assess the resistance to mental fatigue. The values of the reaction time are decreased through exercise, until the athletes reach a set limit in their executions (Aniței, 2007: 135). In almost every age group, males have faster reaction times than females (Dane & Erzurumluoglu, 2003). Yet, age-related deterioration in reaction time is the same in men and women. Simple reaction time shortens from infancy into the late 20s, then increases slowly until the 50s and 60s, and then lengthens faster as the person gets into his 70s and beyond (Der & Deary, 2006). The possibility of predicting the efficiency of motor actions in critical situations (in terms of rhythm, regularity and stability of attention) is given by the ascertainment of the reaction time. Vigilance is regarded as attention in expectation, which manifests when one is waiting for a specific event or sign that requires a quick reaction (Cosmovici, 1996: 68).

The purpose of the study was to investigate the existing correlations between creativity - expressed through fluency (wealth of ideas produced in a certain timeframe) and mental flexibility (as opposed to the rigidity of thinking), resistance to mental fatigue and the coping modalities used by the junior female handball players.

2. Materials and methods

2.1. Participants

A number of 11 junior female handball players aged between 16 and 17 years and having a competitive experience comprised between 6 and 7 years participated in the study. The female athletes represent the junior handball team of School Sports Club No. 2.

2.2. Devices and materials

The devices and materials used in the study were: the computer (only fulfilled the role of support in computerized testing) – the participants did not provide any response to the tests using the keyboard or mouse (the athletes viewed the standardized training on the computer monitor); the computerized RNE test, within PSISELTEVA tests, developed by RQ Plus – the test involves the use of levers and pedals. Today, with the use of computer technology, the accuracy of registrations is ensured. The movements associated with device manipulation (buttons, levers, pedals) are known as instrumental movements (Aniței, 2007: 123). Also, we used the Imagination and Creativity test (Roco, 2004: 205), COPE Survey (Coping Modalities), statistical processing methods – SPSS 20 and data interpretation.

2.3. Procedure

The COPE Survey (Coping Modalities), the computerized RNE test and the Imagination and Creativity test were carried out by the female athletes on the same day and in the same moment of the day – in the afternoon. We mention that the RNE test was previously used in another research (Teodorescu, Urzeală, & Predoiu, 2012) and also the COPE Survey (Grigore et al., 2013). The three different exercises were applied in the same order. In the case of junior female handball players, the preferred hand was used, being generally faster (for the RNE test). The participants were tested without previously practicing any exercise (being in a rest state). The COPE Survey (Coping modalities) implies 53 phrases that express the way in which people feel or act under stress or when they confront a serious problem. The instrument was developed by Carver, Scheier and Weintraub (1989), integrating the stress model designed by Lazarus (1984), which targets 14 coping forms. The subjects' responses are placed on a scale from one to four, in which number one represents "I usually do not do this thing", and number four, "I often do this thing". The 14 scales corresponding to coping strategies are: active coping (concrete actions that follow the elimination of the stressing element), planning (to orientate thinking towards action modalities), eliminating competitive activities, retention from action (until the moment when circumstances may allow action), looking for instrumental support (the tendency to request advice, information), looking for emotional social support (the tendency to seek compassion, moral support from friends, family, colleagues), positive reinterpretation, acceptance, negation (the refusal to accept the existence of a stressing element), emotional discharge (the tendency to reduce distress by expressing negative emotions and dispositions), religious orientation, mental passivity (the problem is avoided by watching movies, visiting friends, practicing sports etc.), behavioural passivity (similar to the concept of helplessness) and resorting to alcohol-medicine. The resistance to mental fatigue, behavioural stability in stand-by and disruptive conditions were assessed through the

computerized RNE test. The screen of the monitor displays the sign “Danger” (red circles with an exclamation mark) on the left/right and a rectangle, where the participant can see three circles. A green circle is on the left of the rectangle, the yellow circle is on the right and the circle from the middle is red. The disappearance of the red circle at occurrent time periods actually indicates the presence of a signal-stimulus. Similarly, on the right/left of the screen, the sign “Danger” comes into sight, which also represents the manifestation of a signal-stimulus. The subject is required to respond by using a lever and two pedals. He/She is asked to solve the task by pushing the lever button when the red light signal disappears and by pushing the left/right pedal when the sign “Danger” comes into sight on the left/ right side. The coefficients provided by the battery software (RNE test) are: average simple reaction time (calculated for the red colour signal-stimuli); vigilance coefficient (results for the “Danger” signal-stimuli); performance coefficient (the ratio between the vigilance coefficient and the average simple reaction time); adequate coefficient – the ratio between the results for the red light signal-stimuli (the correct ones, the anticipated ones, errors, omissions)/ total red light number of stimuli; resistance to mental fatigue coefficient (statistically calculated by relating the adequate coefficient for the last 50 stimuli to the adequate coefficient for the first 50 stimuli); resistance to disruptive factors (results for the first red colour signal-stimulus that appears after the “Danger” signal-stimulus). From the whole Imagination and Creativity test, only the first task was applied. Thus, this test involves the existence of 8 figures. The subject’s task consists in identifying what each figure may represent. The investigated subjects were informed that no model for the responses would be provided, so they could respond anything they thought to be appropriate. Examples for each type of items were given before asking the subjects to respond to each of them. The participants were told to concomitantly look at the tasks. The total response time was 5 minutes. Fluency was scored by the exact number of generated responses. Flexibility was scored by the number of a priori categories that could be formed from the collected responses.

The results obtained by the female handball players at RNE (resistance to mental fatigue) and Imagination and Creativity test were correlated to the results obtained by the athletes for the coping strategies (how they overcome stressful situations).

3. Results

Preliminary data analysis (box-plot charts) emphasized that for the results obtained at: COPE Survey (for the 14 coping strategies), RNE (average simple reaction time, vigilance coefficient, performance coefficient, resistance to mental fatigue coefficient, resistance to disruptive factors) and for the scores registered at the Imagination and Creativity test (fluency and mental flexibility), no extreme values were found.

The Spearman correlation was used in order to verify if there were any relations between creativity - expressed through fluency (wealth of ideas produced in a certain timeframe) and mental flexibility (as opposed to the rigidity of thinking), resistance to mental fatigue and the coping modalities used by the junior female handball players. We mention that the conditions for applying the Spearman correlation have been fulfilled (Labăr, 2008: 87): the sample does not have a large volume (11 subjects); the scores of a variable are monotonously related to the scores of the other variable, meaning that, once the values

of a variable register growth, the values of the other variable will also grow (decrease) – but not necessarily in a linear manner; both variables are ordinal or one of them is quantitative and the other ordinal.

Table 1. Significant results for the coping strategies, computerized RNE test and Imagination and Creativity test

Variables	Spearman's rho Correlation Coefficient		
	performance coefficient	resistance to disruptive factors	fluency
active coping	-0.047	-0.536	-0.451
Planning	0.612*	-0.115	-0.040
eliminating competitive activities	0.286	-0.153	-0.097
retaining from action	0.391	0.466	0.225
looking for instrumental support	0.068	-0.726*	0.135
looking for emotional support	-0.338	-0.766**	-0.241
positive reinterpretation	-0.093	0.233	0.693*
Acceptance	-0.166	0.414	0.149
Denial	0.148	0.118	-0.049
emotional discharge	0.143	-0.715*	-0.420
religious orientation	0.316	-0.504	0.308
mental passivity	-0.364	-0.469	-0.322
behavioural passivity	0.343	0.288	-0.210

**. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed).

Table 1 comprises the analysis of the results, which has revealed that:

There is a positively significant correlation (0.612) between the performance coefficient (a qualitative measure statistically calculated by relating the vigilance coefficient to the average simple reaction time) and the results obtained by the handball players for planning, as a coping strategy ($p < 0.05$).

A proper indicator for the effect size index, in the case of correlation, is the determination coefficient (r^2), which has a value of 0.37. We can tell that 37% of the variation of the two variables is common, while the remaining is due to other influences. This means that the relation between the performance coefficient and planning, as a coping modality, is moderate to strong.

There is a negatively significant correlation (-0.726, -0.766, respectively -0.715) between the resistance to disruptive factor coefficient (when facing a problem - unpredictable appearance of signal-stimuli, distraction - the subject gives correct responses) and the results obtained by the handball players in the case of: looking for instrumental support (the tendency to request advice, information), looking for emotional support (the tendency to seek compassion, moral support from friends, family, colleagues), respectively emotional discharge (the tendency to reduce distress by expressing negative emotions and dispositions), as coping strategies ($p < 0.05$).

The determination coefficient (r^2) has a 0.52 value (looking for instrumental support), a 0.58 value (looking for emotional support), respectively 0.51 (emotional discharge), meaning that the relation between resistance to disruptive factor coefficient and the coping strategies (looking for instrumental support, looking for emotional support, respectively emotional discharge) is strong. There is a positively significant correlation (0.693) between fluency (wealth of ideas produced in a certain

timeframe) and the results obtained by the handball players for positive reinterpretation, as a coping strategy ($p < 0.05$).

The value of the determination coefficient (r^2) is 0.48, which means that the relation between fluency and the results obtained by the handball players for positive reinterpretation, as a coping strategy, is strong.

For the average simple reaction time, vigilance coefficient, performance coefficient, resistance to mental fatigue coefficient (RNE computerized test), as well as for the scores registered by the athletes in the case of mental flexibility (Imagination and Creativity test), we have found that there is no correlation with the coping strategies ($p > 0.05$).

4. Discussions and conclusions

Our research established the existence of certain significant statistical correlations between creativity - expressed through fluency (wealth of ideas produced in a certain timeframe), resistance to mental fatigue and the results obtained by the junior female handball players for the coping strategies. There is a positively significant correlation between creativity - expressed through fluency and the positive interpretation, as a coping strategy. Creativity in team sports is supported by the nonlinear interactions among players. As in any other social system, the way that each player interacts with others (on the field) influences the behaviours of players within the same team and this is a requisite to disturb the actions of opponents (Fajen, Riley, & Turvey, 2009). Highly creative athletes, by self-expression in the full space of constraints (set by the strict rules of team sports), may generate new and functional actions during training and competition (Davids et al., 2014: 272). In the case of handball players, the enhancement of creativity – fluency is related to finding a benefit even in an undesirable situation and new ways of action against the stressful situation. This aspect can be explained by the fact that, in sport, success sheds a rosy light on the recollection of an event and athletes often remember their best performance. Fluency, although it is commonly viewed as a solitary experience, appears to be a team resource and a promoter of team performance in competition with other teams (Moneta, 2014: 199). There is also a positively significant correlation between the performance coefficient (a qualitative measure statistically calculated by relating the vigilance coefficient to the average simple reaction time) and the results obtained by the handball players for planning, as a coping strategy. If the junior handball players register a higher score for the performance coefficient (component of the test assessing the athlete's resistance to mental fatigue), this aspect is related to a better ability to plan (as a strategy to overcome stressful situations) by orienting the thoughts towards the steps and ways of action. Furthermore, there is a negatively significant correlation between the resistance to disruptive factor coefficient (when facing a problem, the subject gives correct responses) and the results obtained by the handball players in the case of: looking for instrumental support, looking for emotional support, respectively emotional discharge, as coping strategies. Through an adequate mental preparation completed by modelling the competition in training, the handball players will be able to improve their ability to give correct responses when facing unpredictable distractions. This can be related to overcoming the stressful situations: with lesser tendency to request advice, lesser tendency to seek compassion, moral support from friends, family, colleagues, and also with a slight attempt to express

negative emotions and dispositions. This study was limited by the psychophysical state of the participants during testing, for example the affective-motivational factors or fatigue might produce fluctuations in the motor responses. The sample of subjects represented another limitation, because it consisted only of female athletes. Observation and conversation are research methods which support the value of our research. The study results provide information useful to coaches in their training strategy, to scientifically conduct the sports training. The research data will also be used by the sport psychologist, who will design stimulation programmes for the characteristics: creativity - expressed through fluency (wealth of ideas produced in a certain timeframe) and resistance to mental fatigue. The COPE Survey (Coping Modalities), Imagination and Creativity and RNE tests may be used for psychological preparation (as complementary means) and can provide important data regarding the coping strategies, creativity and resistance to mental fatigue.

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References

- Aniței, M. (2007). *Psihologie experimentală*. Iași: Polirom.
- Bar-eli, M., Tenenbaum, G., & Elbaz, G. (1990). Psychological performance crisis in high arousal situations – Diagnosticity of rule violations and performance in competitive team-handball. *Anxiety Research*, 2(4), 281-292.
- Brennan, M. A. (1983). Dance creativity measures: A reliability study. *Research Quarterly for Exercise and Sport*, 54(3), 293-295.
- Cosmovici, A. (1996). *Psihologie generală*. Iași: Polirom.
- Davids, K., Araújo, D., Hristovski, R., Balague-Serre, N., Button, C., & Passos, P. (2014). *Complex Systems in Sport*. Routledge.
- Dane, S., & Erzurumluoglu, A. (2003). Sex and handedness differences in eye-hand visual reaction times in handball players. *International Journal of Neuroscience*, 113(7), 923-929.
- Der, G., & Deary, I. J. (2006). Age and sex differences in reaction time in adulthood: Results from the United Kingdom health and lifestyle survey. *Psychology and Aging*, 21(1), 62-73.
- Fajen, B. R., Riley, M. A., & Turvey, M. T. (2009). Information, affordances and the control of action in sport. *International Journal of Sport Psychology*, 40(1), 79-107.
- Grigore, V., Tüdös, S., Mitrache, G., & Predoiu, R. (2013). Formative valencies of the Sport Psychology course. *Social and Behavioral Sciences*, 89, 351-356.
- Jaoui, H. (1990). *La créativité. Mode d'emploi. Applications pratiques*. ESF.
- Labăr, A. V. (2008). *SPSS pentru științele educației*. Iași: Polirom.
- Memmert, D., Baker, J., & Bertsch, C. (2010). Play and practice in the development of sport – specific creativity in team ball sports. *High Ability Studies*, 21(1), 3-18.
- Moneta, G. B. (2014). *Positive Psychology: A Critical Introduction*. Palgrave Macmillan.
- Negulescu, C. I. (1998). *Handbal. Argument pentru un debut timpuriu*. București: Universitas Company.
- Teodorescu, S., Urzeală, C., & Predoiu, R. (2012). Correlative aspects regarding the resistance to mental fatigue and the performance of junior gymnasts. *Social and Behavioral Sciences*, 78, 71-75.
- Törestad, B., Magnusson, D., & Oláh, A. (1990). Coping, control and experience of anxiety: An interactional perspective. *Anxiety Research*, 3(1), 1-16.
- Tüdös, S., & Mitrache, G. (2011). *Mijloace psihoterapeutice*. București: Discobolul.
- Zeidner, M. (1995). Adaptive coping with test situations: A review of the literature. *Educational Psychologist*, 30(3), 123-133.