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Study on analysis the emotion regulation mechanisms responsible for improvement of sport performance in artistic gymnastics

Ramona Ancuța NUT¹, Paula APOSTU², Nicolae Horațiu POP³

Abstract

This study aims to identify mechanisms responsible for the achievements in the artistic gymnastics performance. The main mechanisms we have considered a priori as being mechanisms of change were: anxiety for high performance sport, general self-efficacy, specific self-efficacy in gymnastics, motivation in high performance sport, emotional skills and social skills. Gymnasts from 3 national clubs attended this study. The gymnasts were distributed in 3 lots. The subjects are between 8 and 10 years. Since this study aimed to monitor certain psychological variables and one of the participating group received psychological counseling, before intervention we submitted screening questionnaires related to emotional and behavioral disorders to all groups.

All gymnasts attending the study received questionnaires related to each mechanism monitored both in the beginning and at the end of the emotional development program. During the study the gymnasts were distributed in three lots as follows: the first lot received in addition to classical training methods, an emotional training program and a complex technical training program; the second lot received the same complex technical training program as the first lot; and the third lot did not receive intervention program and the gymnasts were trained following the traditional training program. We have analyzed the results using the procedure described by Weersing, V.R. and Weisz, J.R. [19]: the Efficiency Test, the Specificity of Intervention Test, Mechanisms of Change Test; Mediation Test.

Key words: anxiety, motivation, self-efficacy, emotional control

Rezumat

Obiectivul acestui studiu este de a identifica mecanisme responsabile de rezultatele obținute în ceea ce privește performanța în gimnastica artistică. Mecanismele pe care noi le-am considerat a priori ca fiind mecanisme ale schimbării au fost: anxietatea pentru sportul de performanță, autoeficacitatea generală, autoeficacitatea specifică pentru gimnastică, motivația pentru sport de performanță, competențele emoționale și competențele sociale.

La realizarea acestui studiu au participat gimnaste de la 3 cluburi sportive de gimnastică artistică din țară împărțite în 3 loturi. Subiecții au vârste cuprinse între 8 și 10 ani. Dat fiind că acest studiu și-a propus urmărirea unor variabile psihologice și unul dintre grupurile implicate a primit o intervenție de consiliere psihologică, s-au aplicat înaintea acestei intervenții, la toate grupurile, chestionare de screening pentru tulburări emoționale și comportamentale.

Toate gimnastele din cadrul studiului au primit chestionare pentru fiecare mecanism urmărit, la începutul programului de dezvoltare emoțională și la final. Precizăm că pe perioada studiului de 3 luni, gimnastele au fost împărțite în 3 loturi: lotul 1 a beneficiat, pe lângă metodele clasice de antrenament, de un program de dezvoltare emoțională și un program de pregătire tehnică complexă; lotul 2 a beneficiat de un program de pregătire tehnică complexă, identic cu cel al lotului 1; iar lotul 3 nu a avut intervenție, s-au pregătit după modelele tradiționale de pregătire.

Am analizat rezultatele urmărind procedura descrisă de Weersing, V.R. și Weisz, J.R. [19]: Testul Eficienței; Testul Specificității Intervenției; Testul Mecanismelor Schimbării; Testul Medierii.

Cuvinte cheie: anxietate, motivație, autoeficacitate, control emoțional.

¹ Lecturer, "Babeș-Bolyai" University, Cluj Napoca, Romania, Faculty of Physical Education and Sport, e-mail: nutancuta@yahoo.com

² Assoc. Prof., "Babeș-Bolyai" University, Cluj Napoca, Romania, Faculty of Physical Education and Sport

³ Assoc. Prof., "Babeș-Bolyai" University, Cluj Napoca, Faculty of Physical Education and Sport

Introduction

We choose to target three psychological factors in our research: sport performance anxiety, motivation on sport performance and self-efficacy. We chose these 3 factors starting from the theoretical principles of cognitive behavioral psychology which explain the behavior formation by means of ABC behavioral model. The ABC behavioral model is based on the Skinner's original model (1974) being completed by the findings of the last researches (Albert Bandura or Julian Rotter) related to the manner in which each individual process the information triggered by stimuli. This model supports the idea that either external or internal stimuli trigger a certain response behavior, based on information processing. Depending on the consequences caused by personal behavior, one can decide upon keeping or renouncing to that behavior.

As a result, any behavior is determined by the manner in which the information is processed under the action of external or internal stimuli and that behavior is maintained by its consequences. The name of ABC model comes from this rule: A (antecedent), B (behavior) and C (consequences).

Self-efficacy, anxiety and motivation are important antecedents which may influence the development of a certain behavior. Thus, a high anxiety level can negatively impact the level of self-efficacy, while motivation positively impacts the athlete's performance. In high performance sport, motivation has a determinative role because it stands on the basis of sport training continuity and its developing closest to the optimal parameters. Motivation in high performance sport should be considered both from the perspective of the athlete, the professionals surrounding the athlete (trainers, physician, psychologist, manager, etc.) and from the social perspective (family, friends, etc).

In gymnasts' preparation, motivation plays an important role. Several important aspects of motivation are [10]:

- educating the independent spirit and initiative, by creating certain situations that force gymnasts to find solutions;
- manifesting without any reservation their opinions on understanding the techniques of performing exercises;

- letting gymnasts to face obstacles and demanding them to overcome these obstacles;
- learning gymnasts how to handle their feelings and control their emotions, which is mandatory;
- encouraging gymnasts to overcome their failures;
- using similar conditions in training as in competition;

Bandura's self-efficacy model can also be successfully applied to the sport environment. Schunk [15] perceives self-efficacy as a strong and consistent prediction factor for sport performance. As a general rule, the individuals with a high sense of self-efficacy put more effort and persist in achieving their goals and reach a high level of performance in contrast with those who doubt their capacities [6]. Vealey R.S. and collaborators [17] identified nine sources of confidence in sport. These sports-related sources can have significant practical applications for strengthening the beliefs concerning the athletes' efficacy, depending on the age groups, gender and ability types. These sources are: mastery; demonstration of ability; physical and mental preparation; physical self-representation; social support; trainers' guiding; indirect experience; environmental comfort and the favorable situation. These sources refer to Bandura's theory. Mastery and demonstration of ability are considered to indicate the performance achievement; physical and mental preparation is associated with physical and emotional condition; social support is assimilated with oral persuasion, while the indirect experience is the same thing.

Dzewaltowski, D.A., [8] found a positive relationship between physical exercise associated behaviors: intention, attitude and self-efficacy. Dzewaltowski D.A and collaborators [8], McAuley & collaborators [12], Dishman R. K., [7], show that a moderate correlation between self-efficacy and attendance to physical activities exist, both in young and older adults, while Yordy G.A., Lent, R.W., [18] support the idea that self-efficacy is an important prediction factor for physical activity.

According to a study made by Brawley, L.R. and Martin, K.A (1995), self-efficacy covers between 3 25% from variance in the behaviors associated to physical activity and physical exercise [5].

In what concerns the anxiety, it is a broadly debated subject amongst the athletes and sport specialists. The individuals involved in high performance sport should be aware of the anxiety related symptoms. After being aware of the situation, they should solve their anxiety issues.

Gill (1986) defines the anxiety as a specific reverse side for avoiding the failure in sport. Gymnasts who lack competitiveness do not regard competition as being stimulating; therefore, their negative thoughts and feelings are more amplified near the contest day [10].

According to Kremer, J. and Moran, A., [11] one reason which sustains the tendency for being stressed before contest could be the pressure to perform in front of the audience. In any sport, the spectators constantly assess the athletes' skills, observe them carefully, and that can strongly discourage the athletes who are unprepared for efficiently coping with this pressure.

For many athletes, anxiety can be an extremely unpleasant feeling, accompanied by physiological symptoms which include high heartbeat, sweaty hands and muscle tension. In fact, Ray, R. and Weise-Bjornstal D., [14] underlined that an athlete can experience seven possible categories of stress, including the affective, cognitive and behavioral stress.

Most athletes associate stress with anxiety and injuries. One athlete can feel pressure to succeed, fear to fail or anxiety to overcome an injury. Some athletes must overcome the fear and the anxiety caused by their comeback in sport. As reported by athletes, most significant sources of stress include the fear of failure, concerns related to social assessment made by other persons (especially the trainer), lack of preparation and the fear of losing control of someone else environment.

The main concern of trainers and athletes consists in managing the anxiety level for avoiding the undesired effects caused by manifestation of hypo or hyper anxiety. Psychic regulation and self-regulation techniques (relaxation, desensitization, autogenic training, mental training), which are known and used in practice, help solving these problems in a satisfactory way. The anxiety level depends on many factors [4]: competition type: (friendly, city, county, national, European, international or Olympic competition); experience

in the field of sport, preparation phase: interpretation of competition anxiety symptoms by the subject, and identification of the factors that lead to failure; the effort to defeat an opponent or an adverse team; distance between events with positive or negative impact, which can influence the competition anxiety symptoms; risk associated to certain sports (ski jumping, bobsleigh, skydiving, hang gliding, car racing, motorcycle racing, etc.); gender differences; age differences; individual variability and personality; negative antecedents; psychical micro-traumas, failures, disappointments.

Research objectives

This study aims to identify mechanisms responsible for the results related to performance in artistic gymnastics. To prove that the best performance is recorded within the group which receives improved physical training and psychological training is not enough. We should identify and explain why this is happening. The main mechanisms we have considered a priori as being mechanisms of change were: anxiety for high performance sport, general self-efficacy, specific self-efficacy in gymnastics, motivation in high performance sport, emotional skills and social skills.

Hypotheses

1. Improve sports performance of gymnasts is due to increased motivation for sport performance;
2. Improve sports performance of gymnasts is due to increased self-efficacy;
3. Improve the performance of gymnasts sports performance is due to decrease anxiety;
4. Improving sports performance of gymnasts is due to increased emotional skills;
5. Improve sports performance of gymnasts is due to increased social skills.

Method

We analyzed the results following the procedure described by Weersing and Weisz (2002):

Step 1: Test Efficiency.

Step 2: Test specificity intervention.

Step 3: Test mechanisms of change.

Step 4: Test Mediation.

We performed analysis of change mechanisms for results in terms of competition, because it is ultimately the real challenge of training (technical

or psychological): increased performance in terms of competition. The analysis also was performed on grade change mechanisms composed, reflecting the different results of the entire technical and psychological preparation. Separate performance on machines, we have considered worthy of such an analysis unless significant differences obtained in note composed, and I have had significant differences at a given device and deserved to see further. However, given that we have made significant differences in grade and all appliances (except apparatus jumping at the end of the program, where no significant differences between groups technical and psychological preparation), it makes no sense to stop at a separate analysis of each unit.

Subjects

In this study, we recruited 58 gymnasts divided into 3 groups: 19 gymnasts in group 1, 19 in group 2, 20 in group 3, subjects aged 6 to 10 years.

Measuring Instruments

The instruments applied us in this study were:

- CBCL - The questionnaire asked parents to evaluate the behavior of children 6-18 years [1];
- TRF - Questionnaire for teachers to assess the behavior of children 6-18 years [1];
- Anxiety Scale Performance in Sport (translated version, Sport Anxiety Scale after 2 (SAS-2) [16];
- Self-efficacy Scale sports (translated version Physical Activity Self-Efficacy as Scale (pases) [3];
- Sport Motivation Scale Performance (version translated by The Sports Motivation Scale SMS-28) [13];
- SCE-P - Screening emotional skills, as parents;
- SCS-P Screening social skills, as parents.

Procedure

Since this study aims pursuit of psychological variables involved and one of the groups received a counseling intervention were applied before the intervention, all groups, screening questionnaires for emotional and behavioral disorders. To this end, parents completed the questionnaire CBCL

gymnasts (The questionnaire for assessing the behavior of parents of children 6-18 years) and TRF coaches' questionnaire (Questionnaire for teachers to assess the behavior of children 6-18 years).

After applying and verifying the results of screening questionnaires for emotional and behavioral disorders, they started to follow psychological variables in the three groups of gymnasts. Mechanisms pursued by us in this study were: anxiety, general and specific self-efficacy, motivation, emotional and social skills. All gymnasts in the study received questionnaires for each mechanism followed in early emotional development program and final. Please note that during the study period of 3 months, the gymnasts were divided into 3 groups: group 1 received, in addition to traditional training methods, the emotional development program and a comprehensive technical training program; group 2 received a comprehensive technical training program identical to that of group 1; and group 3 had no intervention were prepared by traditional training models.

Results

The results of the questionnaires (CBCL, TRF) aimed at the identification of emotional and behavioral problems; both as parents and teachers form (which we applied it to coaches) have not identified any cases of such disorders.

So I could watch psychological variables on the assumption of parameters tested normal children.

Step 1. The test efficiency.

Results from previous studies have shown that there are significant differences between groups at the end of the training program. The psychological intervention group has a significantly better performance as compared to standard training group ($t(58) = 5.904$, $p = 0.000$, $d = 1.90$) and to technical training group ($t(58) = 2.579$, $p = 0.014$, $d = 0.83$). The technical training group has a significantly better performance compared to standard training group ($t(58) = 3.067$, $p = 0.004$, $d = 0.98$). Given the significant differences, we can proceed to the next step.

Step 2. Intervention specificity test.

The table below shows the average averages and deviations for all variables considered as possible mechanisms of change in this study, measured in

the three moments, for each of the three training programs.

Table 1. Metadata and standard deviations for all variables taken into account as mechanisms

| | Program S | | | Program PT | | | Program PTP | | |
|------------------------|-----------|--------|--------|------------|--------|-------|-------------|-------|-------|
| | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| Sports | 26.25 | 23.30 | 23.00 | 24.05 | 23.05 | 23.10 | 29.57 | 24.57 | 20.42 |
| Performance | ±6.37 | ±3.89 | ±4.23 | ±5.41 | ±5.13 | ±4.68 | ±8.52 | ±6.14 | ±3.84 |
| Anxiety | | | | | | | | | |
| General self-efficacy | 27.80 | 28.45 | 28.20 | 27.84 | 27.89 | 27.78 | 25.89 | 27.57 | 29.26 |
| | ±2.21 | ±1.93 | ±1.90 | ±2.40 | ±2.46 | ±2.67 | ±3.12 | ±2.71 | ±2.40 |
| Specific self-efficacy | 14.85 | 15.10 | 15.25 | 14.84 | 15.05 | 15.26 | 14.31 | 14.89 | 15.05 |
| | ±0.81 | ±0.71 | ±0.63 | ±1.06 | ±1.07 | ±0.87 | ±1.29 | ±0.80 | ±0.97 |
| Motivation | 74.65 | 76.85 | 76.90 | 80.78 | 80.78 | 81.15 | 78.94 | 81.57 | 86.26 |
| | ±12.67 | ±13.93 | ±13.83 | ±11.2 | ±10.80 | ±9.97 | ±10.93 | ±11.7 | ±8.89 |
| Emotional skills | 60.70 | 62.25 | 62.35 | 60.26 | 60.36 | 60.42 | 57.84 | 63.89 | 67.84 |
| | ±6.40 | ±5.43 | ±5.59 | ±8.47 | ±8.23 | ±8.05 | ±6.18 | ±7.33 | ±5.18 |
| Social skills | 90.00 | 88.80 | 89.05 | 89.47 | 89.47 | 89.21 | 86.31 | 89.00 | 92.36 |
| | ±16.15 | ±5.87 | ±6.58 | ±8.55 | ±8.52 | ±8.44 | ±9.51 | ±9.94 | ±9.43 |

S-standard; PT- technical training; PTP- technical training and psychological

T1- Initial testing; T2- Testing at the end of the emotional development program; T3- Testing at 6 months after program completion

First, we calculated the extent to which the intervention effect resulting in increased levels of self-efficacy, motivation, emotional and social skills and low levels of anxiety. Thus we calculated t test for paired samples, the difference between the pre and post intervention of these variables for each group.

Table 2. The t test for paired samples for the difference between pre-intervention and post-intervention levels of the variables, for each group

| | PS | PT | PTP |
|------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| Sports | t=2.412 | t=3.657 | t=6.502 |
| Performance | p=0.026 | p=0.002 | p=0.000 |
| Anxiety | d=0.55 | d=0.18 | d=1.38 |
| General self-efficacy | t= - 0.769 p=0.451 | t=0.188 p=0.853 | t= -6.780 p=0.000 d= -1.21 |
| Specific self-efficacy | t= - 2.990 p=0.008 d=-0.55 | t= - 3.024 p=0.007 d= -0.43 | t= -3.986 p=0.001 d= -0.64 |
| Motivation | t= - 1.644 p=0.117 | t= - 0.733 p=0.473 | t= -4.540 p=0.000 d= -0.73 |
| Emotional skills | t= -1.238 p=0.231 | t= -0.395 p=0.697 | t= -10.000 p=0.000 d= -1.75 |
| Social skills | t= 0.331 p=0.744 | t= 1.129 p=0.235 | t= -6.348 p=0.000 d= -0.63 |

The results show that training group psychological intervention effect on all variables thought to be mediators. The program has been constructed to produce changes in these variables (based on the literature and preliminary studies). For technical training group intervention lowers anxiety (as the practice more technical training program during execution exercise decreases anxiety competitions) and increased self-efficacy specific to the gym (at the end of the training program gymnasts have greater confidence that can perform exercises). The same variables are affected by the standard of training.

The next step was to compare the three groups at the end of the program, for each of the variables thought to be mediators. We calculated unvaried ANOVA with group membership as an independent variable, the variable at the end of the dependent variable and covariate intervention in pre intervention level variable:

Table 3. Results of unvaried ANOVA test

| | F | Tests post hoc Bonferonni |
|------------------------|---------------------|---------------------------------|
| Sports | F= 12.386 | PTP vs PS: MD= - 3.995, p=0.001 |
| Performance | p=0.000 | PTP vs PT: MD= - 5.035, p=0.000 |
| Anxiety | | |
| General self-efficacy | F= 11.846 | PTP vs PS: MD=2.240, p=0.001 |
| | p=0.000 | PTP vs PT: MD=2.676, p=0.000 |
| Specific self-efficacy | F= 0.299 p=0.743 | - |
| Motivation | F= 8.895 | PTP vs PS: MD=5.730, p=0.005 |
| | p=0.000 | PTP vs PT: MD=6.663, p=0.001 |
| Emotional skills | F= 28.266 | PTP vs PS: MD=7.530, p=0.000 |
| | p=0.000 | PTP vs PT: MD=9.147, p=0.000 |
| Social skills | F= 5.309 | PTP vs PS: MD=5.219 p=0.014 |
| | p=0.008 | PTP vs PT: MD=4.787, p=0.029 |

The results are significant for all variables, except for specific self-efficacy. Post hoc comparisons show that significant differences in favor of psychological intervention group compared to the other two

groups in terms of variables thought to be mediators. Such analysis mechanisms continue to change all variables assumed to be mediators, except specific self-efficacy.

Step 3. Test mechanisms of change. In this step we tried to establish a temporal link between the change that occurs in the alleged mechanisms and the change that occurs in the result sought (performance under conditions of competition). Score change (difference between pre and post intervention) for composite score was correlated with the change score for each of the variables thought to be mediators. Table 4 shows the correlations for each group.

Table 4. Correlations between change scores (pre to post intervention) between the result of the competition and made note allegedly mediators variables for each group.

| | | PTP (N=19) | PT (N=19) | PS (N=20) |
|------------------------------|----------|----------------|-----------|-----------|
| Sports Performance | <i>r</i> | 0.151 | -0.141 | -0.036 |
| | <i>p</i> | 0.536 | 0.564 | 0.881 |
| Anxiety | <i>r</i> | 0.058 | 0.176 | 0.161 |
| | <i>p</i> | 0.813 | 0.471 | 0.498 |
| General self-efficacy | <i>r</i> | 0.058 | 0.176 | 0.161 |
| | <i>p</i> | 0.813 | 0.471 | 0.498 |
| Motivation | <i>r</i> | 0.745** | 0.147 | 0.127 |
| | <i>p</i> | 0.000 | 0.548 | 0.593 |
| Emotional competence | <i>r</i> | 0.392 | 0.305 | 0.127 |
| | <i>p</i> | .097 | 0.203 | 0.595 |
| Social competence | <i>r</i> | 0.092 | 0.449 | 0.296 |
| | <i>p</i> | 0.708 | 0.054 | 0.205 |

After these results remains "standing" one potential mediator motivation. It seems that although the intervention effects on the mediators and the end of the program there are significant differences in favor of PTP compared to the other two groups regarding alleged mediators, things are not so when it comes to change. The only change in performance correlates with the change in motivation and just PTP group. The other two groups, the change in the psychological mechanisms apparently is not relevant to the change in performance.

Step 4. Analysis of mediation

The results obtained so far we only allow analysis of the presumed mechanism motivation mediation. The results show that when the motivation for effective control performance regression coefficient between the program and performance ($B = 0.612$) is reduced, but still significant ($B = 0.553$). Sobel

test indicated that mediation effect is insignificant ($Z = .18, p = .085$). All results are explained below:

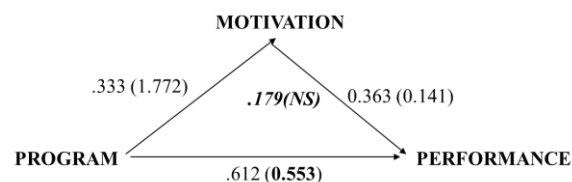


Fig. 1. Diagram of mediation

Discussion and conclusions

Summarizing all the results we can conclude that:

1. Our intervention effect on performance. Group psychological intervention has the best performance at the end of the program, in terms of competition

2. Intervention effects on putative mechanisms. Psychological training program with significantly affecting all the mechanisms assumed, resulting in increased levels of self-efficacy (general and specific gymnastics), and motivation improve emotional and social skills. The psychological intervention leads to significant decreases in anxiety levels. The level of anxiety, and decreases in the other programs, but the effect is a medium size, while the psychological training group have a very large effect size. Regarding specific self-efficacy for gymnastics and the other two groups have high levels of it at the end of the program, with an effect size similar. Comparisons inter groups at the end of the program showed that self-efficacy regarding this specific our intervention, emotional development program, no significant effect compared to the other two programs. For the other five variables but (anxiety, self-efficacy for sports, motivation, emotional and social skills), but the group receiving psychological intervention has the best results compared to the other two groups. I could not, in our analysis, to show a temporal relationship between the change in performance and changes in the arrangements only for motivation variable, where the group psychological intervention. This result is somewhat surprising, given the results obtained so far. We put the issue of statistical power of our study, given the low volume of participants in the 3 groups (19 vs 19 vs 20).

3. Also, we were unable to demonstrate a causal relationship, a relationship of mediation mechanisms thought to be responsible for better performance with psychological training group.

However, the experimental group psychological intervention was clearly has a significant performance superior to other two groups, and the results obtained in steps 1 and 2 from the analysis of mechanisms of change are somewhat encouraging. The problem mechanisms of change are one that remains open. A future study with more participants should investigate the mechanisms of change and determine whether these mechanisms are, but they could be highlighted in batches with few participants, or if other variables are the mechanisms responsible for the progress of this group performance. It would be worth the measured variables such as frequency of participation in training, coping mechanisms, etc. In conclusion, we were able to show that the intervention effect on the mechanisms thought to be mediators, but we could not go all the way this analysis and to demonstrate a causal relationship between the alleged variables and the effect of increasing performance. However, our results are promising, and questions left unclear in this research approach can be investigated in future studies.

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