The factorial validity of Imagery Scale

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Abstract

The present study aimed to construct an Imagery Scale by computing Exploratory Factor Analysis to validate the Imagery Scale, before administering the EFA, the data was analysed for its sampling adequacy. The factor analysis was employed separately on each sub scale.

Initially, seven items measure was administered to 120 Indian artistic gymnasts from different Gymnastics Centre of Allahabad, Hyderabad and Delhi. Exploratory factor analysis supported a 2-factor model that explained 45.28% of the variance. In the next stage 4 items measure was administered to 65 Indian Gymnasts from Bhoir's Gymkhana, Dombivali, Mumbai, the result supported by EFA as one factor model including four statements that explained 50.046% of variance.

KEYWORDS: Imagery, Gymnasts, Sports performance

INTRODUCTION

Imagery, also called visualization, is described as a mental technique that programs the human mind to respond as programmed, by using all the senses to recreate or create an experience. A popular version of imagery is called visual motor behaviour rehearsal (VMBR). Whenever we imagine ourselves performing an action in the absence of physical practice, we are said to be using imagery. It is used to help in Rehearsing new skills, practicing and refining existing skills, Preparing for particular points, Readying for an entire competition, Reduces warm-up decrement, Lowers anxiety and Increases self-confidence. One of the well-documented benefits of mental imagery is its ability to aid in skill acquisition. Studies have shown that visualization is capable of contributing to motor skill development and may be partially substituted for physical practice (during injuries etc.) with no decreases in performance (Hall, 2001).

Heil, J (1995) In sport, the visual and kinesthetic senses are most closely linked to successful performance, as Imagery training is especially useful for skill related performance, and Gymnastics is one of the examples of sports with full of biomechanical skills and techniques involving air born double & triple rotations and twists, catches, landings, take off etc. Because of the difficulty of movements and higher risk of injuries in Gymnastics there is an important role of the sensory-perceptual modalities. For example, touch and sound may be used to create a more realistic scenario (e.g., the feel of grip or bar on your hand; the sound of the wind, judges bell; the scraping of grip or foot on apparatus; the sound of landing etc.); and may provide important performance cues (e.g., the rhythm, push, hold, catch, landing; the tempo of the movements).

It has been recognized that for imagery, like any skill, practice is necessary. Most Gymnasts spend enormous time and energy improving their Gymnastics skills and

other physical skills, while neglecting mental practice. It's a big question that what percentage of practice time are spent practicing gymnastics skills versus developing essential mental skills through techniques such as imagery. In the present scenario we find absence of the later one which has become a need for a good performance at the lower and the higher levels of competitions.

With that we may discover that we are ignoring this crucial part in Indian Gymnastics. As visualisation of a gymnastics skill in slow motion, will a help to memorize it, understand the technique of skills, which helps in learning, and bring automotive perfection of the learned skills. Supported by, Marcus, Eric (1994) generally the greatest diver of all time, visualized each dive. They used visualization when learning new dives and in preparation, for meets and describes seeing a dive in slow motion so he "was able to take the dive apart and memorize it step by step." So it's not only a good competition tool, it's also useful in learning new dives because it helps prepare their mind and can help eliminate the fear stemming from the newness of the movement. It is like a lead-up for head. This example applies to gymnastics as breaking down and visualizing each skill allows mind and body to prepare to learn new skills and to perform old ones perfectly. The more you practice and rehearse these skills in your head, the more likely it will affect your actual performance.
In recent years, researchers have begun to study imagery (Giacobbi, Fallon, & Hall, 2003; Hausenblas, Hall, Rodgers, & Munroe, 1999; Rodgers, 1998; Rodgers, Hall, 2001). Much of the early impetus to study imagery was in response to Hall's (1995) proposal that imagery may influence sports participation and performance. Recent evidence supports these predictions as researchers have shown that now a day's sports person use imagery more frequently (Gammage, Hall, & Rodgers, 2000; Hausenblas et al., 1999). These findings suggest that imagery may be used as an intervention strategy to increase motivation, self-efficacy, and sports adherence leading towards the better sports performance of the Gymnasts.

With number of evidences of successful application and results of mental training (Anderson, 1997; Sing, 1986; Vernacchia, 1997; Yingbo, 1992), standardised tool in sports psychology has always been challenge for researchers and practitioners, the development of a tool is one of the fascinating area for researcher so the research scholar took this challenge to develop a Imagery Training Program and Gone through the related literature pertaining to imagery Skills, Imagery Training and relationship of Imagery Training and performance and Imagery development methods which directed towards the creation of a Imagery Training Program. Before implementing the program, it was essential to construct an instrument (Imagery Test) to test the Imagery Skills of the Gymnasts so that the effect of the training can be assessed objectively.
With an idea of constructing an instrument, researcher could decide to use a questionnaire to be most appropriate tool for assessing Psychological Skills of the Gymnasts, as a Questionnaire is the most frequently used data collection method in educational and evaluation research, Radhakrishna, Leite, and Baggett (2003).
So the conceptualization was done to construct a scale to measure the Imagery for Indian artistic Gymnasts in this study. The purpose of examining Imagery of the gymnasts was to identify their weaknesses and intervene some valid Imagery methods for the better understanding of the bodily movements and performance of the Indian gymnasts.

METHODOLOGY

The development of the scale was carried and completed in five steps. Each step is elaborated in detail.

Step 1—Background In the initial step, the purpose and objectives of the proposed research were examined to test the Imagery Abilities of the Gymnasts so that the weaknesses and strengths of the Gymnasts will be assessed and appropriate intervention programme could be suggested. The Gymnasts who has represented minimum at the district/ state level championships and are able to read and understand the statements of the scale were selected as the samples for the study. A thorough understanding of the problem through literature search and readings was done. After a good preparation and understanding of Step1, it provided the foundation for initiating Step 2.

Step 2—Scale Conceptualization After developing a thorough understanding of the research on Imagery Abilities and gymnast's sports performance, a discussion with experts and athletes was done before the statements for the scale were generated. In this step, content (from literature/theoretical framework) was transformed into statements. In addition, a link among the objectives of the study and their translation into content was established.

Step 3--Format and Data Analysis In Step 3, writing of statements, selection of appropriate scales of measurement, questionnaire layout, format, statements ordering, font size, front and back cover, and proposed data analysis was focussed. Five point likert Scale from strongly disagree to strongly agree was devised to quantify a subject's response on a particular variable by keeping in mind the importance of Understanding the relationship between the level of measurement and the appropriateness of data analysis.

Step 4--Establishing Validity after completing Steps 1-3, a draft questionnaire was ready for establishing validity. Content validity was established using a panel of experts and a field test. Depending on the objectives of the study, content validity was used. The following questions were addressed: Is the questionnaire measuring what it intended to measure? Does it represent the content? Is it appropriate for the sample/population? Is the questionnaire comprehensive enough to collect all the information needed to address the purpose and goals of the study? and Does the instrument look like a scale?

Addressing these questions coupled with carrying out a readability test by offering the scale to the experts, other researchers and athletes to read out the statements of the scale and provide the feedback to the researcher so that necessary changes could be made, if they had any problem in understanding the language and meaning of the framed statements enhanced questionnaire validity. Following a field test on subjects and the expert's opinion some necessary changes were made in the questionnaire.

Step 5--Establishing Reliability In this final step, reliability of the questionnaire using a pilot test was carried out. The internal consistency reliability test was used for the present research. Reliability was established by using a pilot test by collecting data from 120 subjects. On the collected Data exploratory analysis was computed using

SPSS 17 (Statistical Package for Social Sciences) was applied, which provided the key pieces of information i.e Factor loading of the variables, Communalities extraction and KMO & Bartlett's sampling adequacy. After analysing the results 2 statements were deleted, in other words after factor analysis on 7 statements only 5 relevant statements were retained. Finally, the scale comprises of 5 statements.

Selection of Variables

Based on available literature and various researches it is said that Imagery Abilities play important role in enhancing the performance of the individual sports players.

Sample

A total of 120 male and female gymnasts, were selected as the subject from the different Gymnastics centres of Allahabad and Hyderabad. The subjects were ranging from 8 to 28 years of age. The gymnasts were explained with all the instructions and procedure of filling up the questionnaire and were requested to read the instructions carefully before giving the final response to the questions

Statistical Analysis

Exploratory Factor Analysis was computed to validate the Imagery Scale, before administering the EFA, the data was analysed for its sampling adequacy. The factor analysis was employed separately on each sub scale. The findings with regard to different sub scale are presented from the table No. 1 to table No. 4.

Table 1: Correlation Matrix of Imagery Statements

		IM4	IM12	IM20	IM27	IM34	IM41	IM45
Correlation	IM4	1.000	.214	.135	.208	.186	-.045	.049
	IM12		1.000	.230	.097	.283	.156	.090
	IM20			1.000	.155	.149	.008	.038
	IM27				1.000	.276	.077	-.040
	IM34					1.000	.324	.156
	IM41						1.000	.245
	IM45							1.000

a. Determinant = .576

Table, clearly indicates the correlation matrix among different statements of Imagery. The determinant value has been listed at the bottom of the table. The computed value for Imagery is 0.576 which is greater than the necessary value of 0.00001 (Field, 2005). All statements of Imagery correlate fairly well and none of the correlation coefficient is particularly large, therefore there is no need to eliminate any statement at this stage.
Kaiser-Meyer-Olkin was computed for sampling adequacy. The findings are presented in the table 2.

Table 2 – Imagery KMO and Bartlett's Test for sampling Adequacy

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.629
Bartlett's Test of Sphericity Approx. Chi-Square	64.526

Df	21
Sig.	.000

From table no. 2 it is evident that data is appropriate for factor analysis. The above table represents the factor analysis by using the KMO and Bartlett's Test which measures the Kaiser-Meyer-Olkin measure of sampling Adequacy at .629, A value close to 1 indicates that patterns of correlations are relatively compact and so factor analysis should yield distinct and reliable factors. Kaiser (1974) recommends accepting values greater than .50 as acceptable. If values between .5 to .7 it is considered as mediocre, values between .7 to .8 are good, values between .8 to .9 are great and values above .9 superb. In table KMO is .629 which falls into the range of .5 to .7 which shows the data is mediocre, which reveals factor analysis can be applied on the data.

Bartlett's test is significant at .001 therefore factor analysis is appropriate to apply on the collected data.

The exploratory factor analysis on Imagery items reveals that the communalities after extraction are ranging from .323 to .642. Two factor solutions emerges and accounts for 45.284% of the total variance with Eigen value 1.914 and 1.256 respectively in 4 retained items. The first factor for 44.895% and the second factor for 25.853% of the total explained variance. The factor loading of 2 items in first variable are ranging from .547 to .647 and in second variable the loading of two items range from .549 to .671.

Statement Imagery_45 was reframed as the reframed statement was more appropriate in relation of the gymnasts. Whereas statements *Imagery_20*, *Imagery_27* and *Imagery_41* were deleted as they were not suitable statements in relation to the Gymnasts. The items loaded highly on first variable seem to relate with ***situation based Imagery*** whereas the items that load highly on second variable seem to be ***performance/skill based Imagery***. The EFA was again computed and the factor loading on the factor is presented in table no. 3.

Table 3: Factor Loading, Communalities Eigen values, Percentage of explained variance of the Imagery Statements.

Variables Item (4)	**Rotated Component Matrix**	**Communalities Extraction**
IM3	.642	.412
IM10	.701	.492
IM17	.752	.566
IM23	.729	.532
Eigenvalues	2.002	
% of Variance	50.046	

In the above table Imagery is factor analysed. The communalities after extraction are ranging from .412 to .566. One factor solution with eigen value 2.002 is emerged which account for 50.046% of the variance. All the four items are highly loaded on

one factor and the factor loadings are ranging from .642 to .752, representing use and awareness of Imagery in the gymnasts.

Table 5: Reliability Statistics

Statement Numbers with item	Number of Item	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
Imagery_3	**4**	**.666**	.637
Imagery_10			.617
Imagery_17			.561
Imagery_23			.572

The table indicates that four statements in Imagery's cronbach's alpha is .666.

DISCUSSION OF FINDINGS

The above analysed data and the interpreted table clearly reveals that initially there were 7 statements in the questionnaire testing imagery but after the factor analysis three statements were deleted on the basis of poor factor loading value, extraction value and to avoid the statements carrying the same meaning webbed in different words.

So, finally 4 statements were retained in the questionnaire, which was less time consuming and easily administrable, testing an important psychological factor namely, Imagery. Further the questionnaire was administered on 120 subjects, the collected data was further analysed by calculating the item analysis which reveals that Psychic energy management had Cronbach's Alpha .666.

CONCLUSIONS

1. The following statements were drawn under Imagery Factor:

Imagery

1. I imagine situations to solve the problems
2. I often visualize myself being rewarded when successful in competition.
3. I visualize myself performing perfectly.
4. I am able to visualize a particular skill before my performance.

2. This scale may be administered for training purpose. However, this form of scale is not advised to use to asses as variable for Psychological Skills.

Psychological tests can play a crucial role in identifying the strengths and weaknesses of athletes and evaluating the effectiveness of psychological skills training programs. (Anshel & Lidor, 2012; Marchant, 2010; Morgan, 1980).

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