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Impact of music in sportive activities scale (IMSAS): Validity and reliability assessment

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ABSTRACT

The aim of this study was to develop a tool in order to measure the impact of music on the sportive activities. The study group 170 professional athletes, who are actively playing in the municipal sport club in Istanbul in basketball, physically disabled (swimming), wrestling, judo, karate, taekwondo, volleyball, swimming, and fitness branches. Thus, it was assumed that the sample represented the population. The construct validity of the scale was tested through the exploratory factor analysis and confirmatory factor analysis. The reliability of the scale was measured through the Cronbach Alpha and test-retest method. The distinctiveness of the scale was tested over the difference between the min 27% and max 27%. Correlation analysis was conducted among the scale factors. In order to calculate the reliability of the 18 items in the Impact of Music on Sportive Activities Scale, the “Cronbach Alpha”, which is the internal consistency coefficient, was calculated. The general reliability of the scale was determined to be very high, alpha=0.885. It was determined that the analysis results, confirmatory factor analysis, and compliance statistics demonstrated a good fit, and as a conclusion of the correlation analysis, positive correlations were detected between the Scale sub-dimensions and overall scores ($p < 0.05$).

Keywords: Physical education and sports, sportive performance, music.

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INTRODUCTION

Music is among the arts that have mostly influenced society and individual both in intellectual and emotional terms with its infinite span since the ancient times. Music is a phenomenon that motivates people as an essential element of our lives and embraces the individual in every part of life that is intertwined with individuals. We are together with music in the cradle or in the bosom of our mothers, on the street, at home, at school, at work, at leisure and entertainment places, at ceremonies and meetings, on radio and television. The baby in the womb is affected by the rhythm of the mother's heartbeat, so when the baby finds this familiar sound again in the lap of his/her mother after birth, he/she relaxes and stops crying. In the following years, the influence of music on the child turns into a form of direct relationship, becoming increasingly rich and diverse, continuing throughout his/her life (Ucan, 1996). The person who interacts with the music begins to acquire musical behaviors in time; analogy, listening, muttering, dancing, whistling, tapping to the beat, singing, strumming, criticizing, liking, composing, playing instruments, etc. what these attitudes have in common is the harmony with music. Music gives individuals the opportunity to express themselves, to perform themselves, to know themselves and to go beyond themselves (Say, 2008).

Among its benefits for people, it is also known that music is used as a treatment method. It is a method of communication used to determine the psychiatric conditions of children and adults with physical and mental problems. It is also known that the history of treatment with music, which is of great importance for the treatments and lives of individuals, reaches to the America, Africa, Europe, Asia, and many Turkish civilizations (Koc et al., 2011). Primitive humans believed

that evil beings called genie or demons caused diseases. These evil beings were controlled by treatment ceremonies led by physicians, shamans, and wizards. Music, rhythm, dance, and songs were the indispensable phenomena of these treatment ceremonies. The effects of music on the brain are also known. Listening to music involves evolutionary functions such as collaboration, communication, social integrity and group coordination within the individual community. It is also a multifaceted phenomenon in the brain that activates all mental functions such as emotion, perception, teaching, learning and memory (Yazici, 2017). We consider that sport is one of the areas under the influence of music. Today's research shows that music has beneficial effects on exercise and relaxation. In order to establish the state of self-awareness of the individual: it is necessary to ensure 'individual attention', 'internal focalization', and 'cutting off from the outside world'. As a result of a study on exercise performed with and without music, it was determined that music had positive effects on the whole mechanism as an external factor (Erdal, 2005). According to the effects on physical strength-based walking, endurance performance and motor skills performed with different varieties of music involve a psychological interaction. Many of the fitness centers have been equipped with high capacity sound (music) systems, and it is natural for us to meet people who are jogging while listening to music (Koc et al., 2011). Before the competitions, athletes listen to upbeat/dynamic music, which was observed to minimize the stress created by the competition particularly with the participation of their fans in this action in terms of improving their performance and mood (Karageorghis et al., 1997).

Based on the results of previous research studies, it was determined that the use of music in exercise by athletes positively affects them in terms of self-esteem, self-confidence, sticking to the point and exercising more (Mavi, 2012). Depending on these studies, we speculated that music and sport are intertwined. Therefore, the main purpose of this study was to determine the effectiveness of music in sport activities. Previous studies demonstrated the positive effects of listening to music on athletes' performances; however, no measurement tool was encountered that applied the descriptive survey model.

MATERIALS AND METHODS

This research is designed in a descriptive survey model. Since, it was intended to develop a scale, certain stages were followed such as determining the characteristics to be tested, writing the items to be included in the scale, obtaining expert opinion and rearranging the items, conducting the application and employing the validity and reliability analyses (Altun and Buyukozturk, 2011; Cronbach, 1984).

Study group

The population of the study was comprised of all the professional athletes actively playing in the municipal sport club in Istanbul, and the study group included 170 active professional athletes who achieved national and international awards in the same club and were selected through the convenience sampling method (Table 1). Depending on their sport branches, the athletes in the study group were reacted in parallel to the impact of the music on themselves, before, during, and after the sportive activities (training, personal exercise, leisure etc.).

Examining the descriptive statistics of the study group, it was determined that 69 (40.6%) athletes were female and 101 (59.4%) were male; 47 (27.6%) athletes were in the 14-18 age group, 75 (44.1%) were in the 19-22 age group, and 48 (28.2%) were in the 23 and over age group; 67 (39.4%) of them were graduates of high school, 96 (56.5%) of university, and 7 (4.1%) of postgraduate schools. Concerning their branches, it was determined that 20 (11.8%) were basketball players, 1 (0.6%) was physically handicapped (swimming), 19 (11.2%) were wrestlers, 20 (11,8%) were dealing with judo, 34 (20.0%) were karate players, 27 (15.9%) were taekwondo players, 12 (7.1%) volleyball players, 4 (2.4%) were swimmers, and 33 (19.4%) were dealing with fitness. In terms of the sport age, 21 (12.4%) were doing sport for less than 1 year, 28 (16.5%) for 2-4 years, 33 (19.4%) for 5-7 years, 48 (28.2%) for 8-10 years, 22 (12.9%) for 11-13 years, and 18 (10.6%) for 14 or more years. Concerning the frequency of listening to music, 109 (64.1%) athletes answered as *always*, 56 (32.9%) as *sometimes*, and 5 (2.9%) responded as *rarely*.

Data collection tools

In the first phase of scale development, the literature on music and sports was examined and the importance of music on sports was tried to be determined. A question pool comprising of 34 questions was developed based on the literature review. The question form was presented to 6 experts in total: 2 from the Department of Physical Education and Sports, 2 from the Department of Sports Management, 1 from the Department of Coaching Education, and 1 from the Department of Music Education. The experts evaluated the comprehensibility of the items and their suitability with the characteristics of the athletes. According to the expert opinions, 8 items were removed from the scale and some items were corrected in terms of comprehensibility. Following this arrangement, a 26-point draft form was created. As a result of the reliability analysis of the draft form consisting of 26 questions, 8 items were excluded from the scale, and ultimately, the 18-item *impact of music in sports activities scale* was developed. In the draft form,

Table 1. Descriptive statistics concerning the study group.

Groups	Frequency (n)	Percentage (%)
Gender		
Female	69	40.6
Male	101	59.4
Age		
14-18	47	27.6
19-22	75	44.1
23 and over	48	28.2
Educational status		
High School	67	39.4
University	96	56.5
Postgraduate	7	4.1
Sport branch		
Basketball	20	11.8
Physically disabled (swimming)	1	0.6
Wrestling	19	11.2
Judo	20	11.8
Karate	34	20.0
Taekwondo	27	15.9
Volleyball	12	7.1
Swimming	4	2.4
Fitness	33	19.4
Sport age		
Less than 1 year	21	12.4
2-4 years	28	16.5
5-7 years	33	19.4
8-10 years	48	28.2
11-13 years	22	12.9
14 and over	18	10.6
Frequency of listening to music		
Always	109	64.1
Sometimes	56	32.9
Rarely	5	2.9

participants were asked to express their opinions on a 5-point Likert scale ranging between “Definitely disagree”, “Disagree”, “Neutral”, “Agree” and “Definitely agree” under the following options: Before the Sportive Activity, During the Sportive Activity, and After the Sportive Activity. Data collection process was conducted before the scale was administered to the participants, the aim of the research was explained, and only volunteering athletes were asked to participate in the activity.

Statistical analysis

The research data were analyzed through the SPSS (Statistical Package for Social Sciences) for Windows 22.0 program and the AMOS program. In the evaluation of the data, exploratory factor analysis, confirmatory factor analysis, correlation analysis, t-test, and descriptive statistics were used. The scale items were analyzed through a statistical method known as the Mahalanobis distance multivariate extreme values, and it was determined that there were no extreme values. Normal distribution test was applied to the scale items (Table 2).

In the relevant literature, the cases having kurtosis and skewness results between +1.5 and -1.5 (Tabachnick and Fidell, 2013) and between +2.0 and -2.0 (George and Mallery, 2010) are accepted to have normal distribution.

Table 2. Normal distribution, kurtosis and skewness test.

	Kurtosis	Skewness
Q1	1.690	-1.180
Q2	0.909	-1.017
Q3	1.924	-1.187
Q4	1.460	-1.215
Q5	1.572	-1.262
Q6	1.615	-1.280
Q7	0.945	-1.114
Q8	2.114	-1.423
Q9	1.239	-1.211
Q10	1.007	-1.119
Q11	0.796	-1.102
Q12	1.486	-1.193
Q13	1.481	-1.138
Q14	0.843	-1.026
Q15	1.719	-1.265
Q16	1.696	-1.241
Q17	1.116	-1.129
Q18	1.386	-1.270

RESULTS

Reliability and item analysis

In order to determine the internal consistency of the Impact of Music on Sportive Activities Scale, reliability analysis and item analysis were employed. Reliability analysis demonstrates whether the items in the scale are consistent among themselves and with the overall scale. It also determines whether scale expressions are understood in the same way by subjects. Reliability is the consistency among the responses of participants to the items of the scale (Buyukozturk, 2011). In the literature, the reliability (internal consistency) of the scale is generally determined by Cronbach's Alpha coefficient. The evaluation criteria used in the evaluation of Cronbach's Alpha coefficient are: “if $0.00 \leq \alpha < 0.40$, then scale is not reliable”, “if $0.40 \leq \alpha < 0.60$, then scale has low reliability”, “if $0.60 \leq \alpha < 0.80$, then scale is very reliable”, “if $0.80 \leq \alpha < 1.00$, then scale is a highly reliable scale” (Ozdamar, 2004).

The reliability analysis was implemented for the Impact of Music on the Sportive Activities Scale, and Alpha coefficient was determined as 0.885. The item analyses in terms of the impact of items to the internal consistency are given in Table 3.

When the total item correlation and correlation coefficient of an item on the scale is 0.3 and above, this suggests that it is highly distinctive (Buyukozturk, 2011:171; Tavsancil, 2010). When the table was examined, it was observed that the total item correlation values varied between 0.43 and 0.57. When the Cronbach Alpha-when the item deleted and total item correlation values were examined, it was determined that there was no item reducing the internal consistency.

Factor analysis

In order to reveal the construct validity of the scale, exploratory factor analysis was implemented. As a result of the Barlett test ($p=0.000<0.01$), it was determined that there was a relationship among the variables included into the factor analysis. As a conclusion of the test ($KMO=0.912>0.60$), it was determined that the sample size was sufficient for the application of the factor analysis. The varimax method was chosen in the implementation of the factor analysis and the structure of the relationship among factors remained the same. As a result of the factor analysis, the variables were collected under 3 factors with a total explained variance of 48.388%. The resulting factor structure of the scale is given in Table 4.

Depending on certain values such as alpha, explained variance, and factor loads calculated for reliability, it was understood that the Impact of Music on Sportive Applications Scale is a valid and reliable tool.

Confirmatory factor analysis

Confirmatory Factor Analysis is a type of structural equation model that can measure the relationship among observed variables and latent variables (Brown, 2015). Confirmatory factor analysis is used for verifying a scale with a certain factor structure. In this study, the goodness of fit indices, which were used in the studies in the literature most, were used in this study. Certain reference values and other obtained values are given in Table 5.

The correlation coefficient between the goodness of fit values and the factors should be less than 0.85. The validity of the distinction that the factors are separate from each other must be ensured. In addition, it is necessary that factor loads are high, error variances are low, and explanatoriness (R2) values created by items on factor are high (Kline, 2005; Cokluk et al., 2010). Moreover, Awang (2015) suggests that factor loads should not be less than 0.50.

The results of the analysis show that the model of compliance statistics calculated by confirmatory factor analysis is admissibly compatible with the actual data collected from the participants. This indicates that the scale fits well with the previously determined exploratory factor structure. The diagram for confirmatory factor analysis is given in Figure 1.

Modification indices were also examined concerning this model and modification was conducted between to item-couples that might cause multicollinearity and singularity problem (Brown, 2015).

Standardized factor loads, t values, and the

Table 3. Item analysis of the impact of music on sportive activities scale.

	Scale score when the item is deleted	Variance when the item is deleted	Total item correlation	Cronbach Alpha when the item is deleted
Q1	71.6980	77.634	.472	.880
Q2	71.8176	77.552	.432	.882
Q3	71.7176	76.954	.524	.878
Q4	71.6941	77.726	.442	.881
Q5	71.7098	76.289	.527	.878
Q6	71.7294	76.174	.523	.878
Q7	71.7529	76.524	.490	.880
Q8	71.6902	76.030	.534	.878
Q9	71.8412	74.802	.554	.877
Q10	71.7392	75.431	.571	.877
Q11	71.7216	76.374	.511	.879
Q12	71.7157	77.096	.482	.880
Q13	71.7373	76.426	.538	.878
Q14	71.7020	76.516	.556	.877
Q15	71.7706	75.332	.569	.877
Q16	71.7627	75.981	.536	.878
Q17	71.7549	76.099	.529	.878
Q18	71.7451	77.110	.443	.881

Table 4. Factor structure of impact of music on sportive activities scale.

Dimension	Factor load
Psychological Endurance (Eigenvalue=6.116; Explained Variance=18.573; Alpha=0.806)	
Q17. Listening to music during sportive activities helps me in my anger management	0.673
Q16. Listening to music during sportive activities takes me away from negative feelings and thoughts	0.669
Q12. Listening to music during sportive activities helps me relax	0.649
Q13. Listening to music during sportive activities takes me away from stress	0.640
Q18. Listening to music during sportive activities helps me evaluate retrospectively what I've done	0.612
Q15. Listening to music during sportive activities helps me recover early	0.599
Q14. Listening to music during sportive activities heals me	0.524
Physical Strength and Performance (Eigenvalue=1.416; Explained Variance=15.840; alpha=0.785)	
Q8. Listening to music during sportive activities makes me feel more powerful	0.712
Q7. Listening to music during sportive activities increases my endurance	0.690
Q9. Listening to music during sportive activities contributes to my hormonal balance	0.676
Q10. Listening to music during sportive activities improves my coordination	0.598
Q11. Listening to music during sportive activities supports my mental tranquility	0.484
Q6. Listening to music during sportive activities increases my physical performance	0.483
Motivation (Eigenvalue=1.178; Explained Variance=13.975; alpha=0.718)	
Q4. Listening to music during sportive activities increases my energy	0.716
Q3. Listening to music during sportive activities increases my well-being	0.660
Q2. Listening to music during sportive activities helps me get rid of my fear, sorrow, anxiety etc. situations	0.619
Q5. Listening to music during sportive activities better motivates me for what I am doing	0.553
Q1. Listening to music during sportive activities increases my concentration	0.519
Total Variance=%48.388; Overall Reliability (Alpha)=0.885	

explanatoriness (R^2) values of the items are given in Table 6.

When the standardized coefficients were examined, it was determined that the factor loads were high, standard error values were low, t values were significant

Table 5. Goodness of fit indices and normal values.

Indices	Normal value	Admissible value	Scale
χ2/sd	<2	<5	2.54
GFI	>0.95	>0.90	0.93
AGFI	>0.95	>0.90	0.91
CFI	>0.95	>0.90	0.92
RMSEA	<0.05	<0.08	0.06
RMR	<0.05	<0.08	0.03

Sources: Schumackerand and Lomax (2010), Simsek (2007), Sumer (2000), Tabachnick and Fidel (2007), Waltz et al. (2010), and Wangand and Wang (2012).

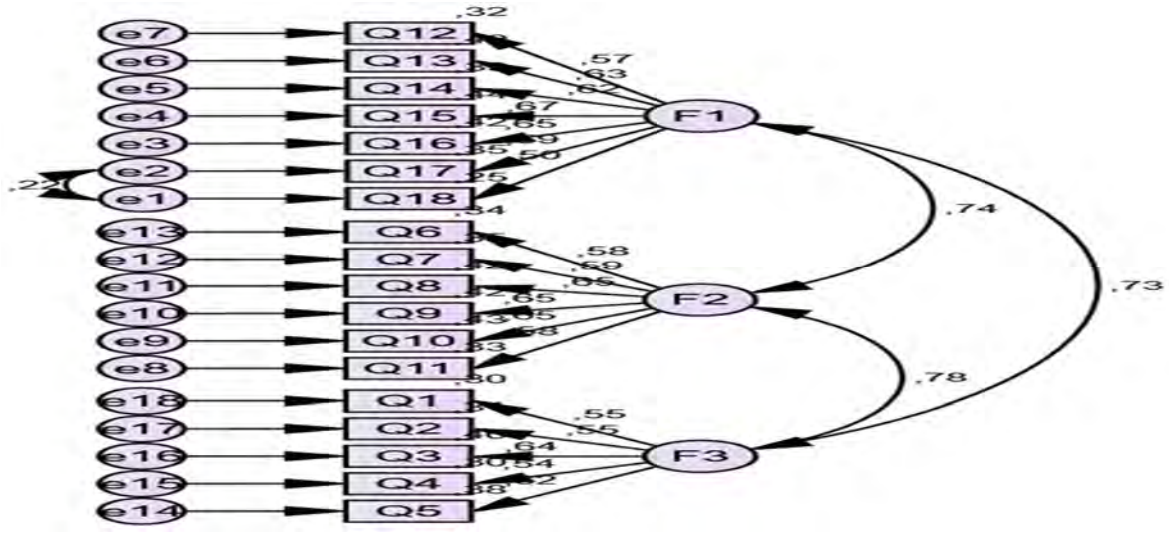

Figure 1. Diagram concerning the factor analysis of the impact of music on sportive activities scale.

Table 6. Regression coefficients concerning the factor loads and items of impact of music on sportive activities scale.

Items		Factors	β	Std. β	S.Err	t	p	R^2
Q18	<---	F1	1.000	0.500				0.302
Q17	<---	F1	1.151	0.594	0.110	10.445	p<0.001	0.307
Q16	<---	F1	1.259	0.648	0.131	9.608	p<0.001	0.404
Q15	<---	F1	1.314	0.666	0.135	9.735	p<0.001	0.296
Q14	<---	F1	1.109	0.625	0.118	9.429	p<0.001	0.382
Q13	<---	F1	1.159	0.629	0.123	9.463	p<0.001	0.338
Q12	<---	F1	1.066	0.569	0.119	8.956	p<0.001	0.347
Q11	<---	F2	1.000	0.576				0.418
Q10	<---	F2	1.141	0.653	0.104	10.967	p<0.001	0.420
Q9	<---	F2	1.235	0.648	0.113	10.913	p<0.001	0.427
Q8	<---	F2	1.122	0.646	0.103	10.888	p<0.001	0.332
Q7	<---	F2	1.042	0.589	0.102	10.231	p<0.001	0.324
Q6	<---	F2	1.012	0.582	0.100	10.135	p<0.001	0.396
Q5	<---	F3	1.000	0.618				0.391
Q4	<---	F3	0.859	0.544	0.088	9.734	p<0.001	0.443
Q3	<---	F3	0.958	0.636	0.088	10.919	p<0.001	0.420
Q2	<---	F3	0.910	0.554	0.092	9.873	p<0.001	0.353
Q1	<---	F3	0.831	0.550	0.085	9.811	p<0.001	0.250

($p < 0.001$), and R^2 values were high. These results verify the construct validity concerning the predetermined factor structure.

Distinctiveness

The t-test results concerning the significant difference in the min 27% and max 27% groups of the scale scores are given in Table 7.

There are statistically significant differences in the scale scores concerning the Min 27% and Max 27% groups ($p < 0.05$). According to these results, it was determined that sensitive measurements were made so as to determine the differences of the scale. The correlation analysis and descriptive statistics among the sub-dimensions of the scale are given in Table 8.

Examining the correlation analysis among the psychological endurance, physical strength and performance, motivation, and overall impact of music on sportive activities dimensions, it was determined that there was a positive correlation among them ($p < 0.05$).

Table 7. Differentiation of the impact of music on sportive activities scores concerning the min 27% and max 27% groups.

Groups	Min 27%		Max 27%		t	p
	Mean	SD	Mean	SD		
Psychological endurance	3.547	0.564	4.780	0.249	-23.499	**0.000**
Physical strength and performance	3.553	0.664	4.772	0.252	-20.163	**0.000**
Motivation	3.655	0.584	4.730	0.318	-18.995	**0.000**
Overall Impact of music on sportive activities	3.579	0.440	4.763	0.174	-29.428	**0.000**

Table 8. Dimensions of the scale.

	Mean	Standard deviation	Psychological endurance	Physical strength and performance	Motivation	Overall scale
Psychological endurance	4.218	0.596	1.000			
Physical strength and performance	4.213	0.632	0.592**	1.000		
Motivation	4.231	0.584	0.538**	0.583**	1.000	
Overall Scale	4.220	0.513	0.866**	0.864**	0.800**	1.000

*<0.05; **<0.01.

CONCLUSIONS AND IMPLICATIONS

The aim of this study was to develop a scale that can be used to determine the impact of music in sportive activities, and to test its validity and reliability.

In this study, in order to determine the impact of music on sports activities, an 18-item scale was developed, which consisted of 3 sub-dimensions as psychological endurance, physical strength and performance, and motivation. The psychological endurance dimension of the IMSAS scale consists of 7 items, the physical strength and performance dimension includes 6 items, and the motivation dimension incorporates 5 items. Construct validity analysis results of the scale demonstrated that the scale items had an admissible level of factor load, indicating that the scale was in a three-factor structure.

Reliability analysis was employed for the impact of music on sports activities scale, and the Alpha coefficient was determined as 0.885. It was observed that the item total correlation values varied between 0.43 and 0.57. When we examined the item total correlation and Cronbach Alpha values (when the item deleted), it was determined that there was no item that reduced the internal consistency (Table 3). A positive correlation was detected among psychological endurance, physical strength and performance, motivation, and the overall effect of music on sportive activities (Table 8).

There are only few studies in the literature examining music and sports together. In a previous study conducted by Kartal and Ergin (2018), it was found that listening to the favorite music type contributes to the performances of athletes.

In another study conducted by Yenigun et al. (2007), it was observed that muscle strength values increased as a result of training practices with music and it was found that step aerobic exercises at certain musical speeds were an effective method for improving the endurance of the knee extensor and flexor muscles.

In the results of a study conducted by Vatansever et al. (2018), listening to fast music during maximal exercise was found to cause lengthening of exercise time and

increased maximal heart rate. It was also revealed that listening to slow music after exercise increases the recovery rate.

In study investigating the effects of music on heart rate and walking distance during a walk conducted by Beckett (1990), it was concluded that, owing to the music, there were significantly higher HR (heart rate) results and participants walked for longer distances.

In a study examining the effects of asynchronous music on netball players conducted by Pates et al. (2002), it was emphasized that music can enhance athletic performance along with triggered emotions and concepts linked to the imagination.

Based on these studies, it was obvious that studies conducted on music and sports were generally experimental studies based on performance. Following the determination about the effect of music on sportive activities, the development of this scale was needed for further studies to be able to reveal psychological and motivational effects of music on sportive activities as well as its obvious performance and physical effects.

These results indicate that the validity and reliability of the IMSAS scale are sufficient. This ultimate form of the scale is considered to contribute to the literature as a reliable and valid measurement tool for determining the impact of music on sportive activities. Further studies are needed, by comparisons of athletes from different countries, by including amateur athletes besides the professional ones, by comparing different sport branches, and the pre-to post-test scores of a group, who have not participated in measurement of the impact of music on sportive activities.

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