Construction of Protocol Dimensions and Items for Screening Music Abilities (PSHM)

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Abstract

The objective of this article is to present how and what dimensions were elaborated for the construction of items of the Protocol for Screening of Musical Abilities (PSHM). It is exploratory research, with systematic review in a database, which made it possible to find 14 surveys, allowing the selection of 26 dimensions separated into six blocks of Abilities (perceptual, rhythmic, of creation, memory, motor, and involvement with the assignment). There was an arbitrary selection based on the psychophysical method of peer comparison and screening technique and the analysis of the construct by eight (8) expert judges, with the cut-off point established for the agreement rate of 0.75%. Eight dimensions were selected (timbre, pitch, melody, intensity, harmony, duration, agogic, and rhythmic pattern) divided into two blocks (perceptual and rhythmic Abilities). The PSHM validation will be continued to be possible the screening of musical talent in other age groups.

Keywords: Music education, Music talent, Protocol for Screening Musical Abilities, Identification.

Elaboração de dimensões e itens do Protocolo para Screening de Habilidades Musicais (PSHM)

Resumo

O objetivo deste artigo é apresentar como e quais dimensões foram elaboradas para a construção de itens do Protocolo para Screening de Habilidades Music-

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ais (PSHM). Trata-se de uma pesquisa exploratória, com revisão sistemática em banco de dados, a qual possibilitou encontrar 14 pesquisas, permitindo selecionar 26 dimensões separadas em seis blocos de habilidades (perceptivas/sensoriais, rítmicas, de criação, memória, motora e envolvimento com a tarefa). Houve uma seleção arbitrária baseado no método psicofísico de comparação por pares e técnica para screening e a análise de constructo por oito (8) juízes especialistas, sendo a nota de corte estabelecida para o índice de concordância de 0.75%. Foram selecionadas oito dimensões (timbre, altura, melodia, intensidade, harmonia, duração, agógica e padrão-rítmico) divididas em dois blocos (habilidades perceptivas/sensoriais e habilidades rítmicas). A validação do PSHM terá continuidade para ser possível o rastreamento do talento musical em outras faixas etárias.

Palavras-chave: Educação Musical, Talento Musical, Protocolo para Screening de Habilidades Musicais, Identificação.

Elaboración de dimensiones e ítems del Protocolo de Screening de Habilidades Musicales (PSHM)

Resumen

El objetivo de este artículo es presentar cómo y qué dimensiones se elaboraran para la construcción de ítems del Protocolo de Proyección de Habilidades Musicales. Se trata de una investigación exploratoria, con revisión sistemática en una base de datos, que permitió encontrar 14 encuestas, permitiendo la selección de 26 dimensiones separadas en seis bloques de habilidades (perceptiva/sensorial, rítmica, de creación, memoria, motora e implicación con la asignación). Se realizó una selección arbitraria basada en el método psicofísico de comparación entre pares y técnica de cribado y el análisis del constructo por ocho (8) jueces expertos, con el punto de corte establecido para el índice de concordancia del 0.75%. Se seleccionaran ocho dimensiones (timbre, tono, melodía, intensidad, armonía, duración, patrón agógico y rítmico) divididas en dos bloques (habilidades perceptivas/sensoriales y habilidades rítmicas). La validación del PSHM tendrá seguimiento para rastrear el talento musical en otras edades.

Palabras Clave: Educación Musical, Talento Musical, Protocolo de Proyección de Habilidades Musicales, Identificación.

Introduction

Musical abilities are related to several aspects that make up musical talent, one of which is sensory and rhythmic perception, which can be considered bases for the identification of musical talent, initially (Kirnarskaya, 2004). Cultural and temporal issues also permeate the abilities, and they can relate to different areas of human behavior (Lehmann et al., 2007; Sloboda, 2008). Each population will present its sound and rhythmic peculiarity as well as the way they perceive the sound and understand it, these are the ethnomusicological conceptions (Kunst, 1959; Merriam, 1964; Nettl, 1964).

When it comes to perceptual abilities, psychological and decoding mechanisms are involved (Kirnarskaya, 2004). The process of listening (stimulus input), hearing (brain processing) and understanding sound stimuli (sense/understanding of the stimulus) permeate musical abilities (Roederer, 2002; Willems, 2011).

Roederer (2002) argues that the rhythm and sequences of sounds, such as the melodic curve, are processed in the left hemisphere of the brain, while in the right are processed pitch, timbre, tone and harmonic. Tonal memory also operates in the right hemisphere.

Musical abilities can be impacted by elementary and higher abilities. Teplov (1966) defines elementary abilities as those that manifest themselves in the subject before formal contact with music, it is an eminent potential in the subject, while the superior ones manifest after direct and intentional/formal contact with music, and it is an awareness of what is created and what is achieved with music in terms of aptitude. For the author, identifying them early can contribute to a better development of the talented subject.

For Haroutounian (2002) there is, in the actions and conduct of the talented subject, a type of spark, which can be understood as the difference between a talented subject and an expert. This difference, according to her, can be felt in the interpretation, creativity, perception and musicality as a whole. In these cases, the subject presents a different element and more in his musical productivity to the point of conquering the audience due to his originality.

Kirnarskaya (2013) postulates that music talent is sustained by motivation, creativity (giftedness) and abilities, which, for the author, are configured in musical intelligence. In this context, Kirnarskaya (2004) organizes the abilities in expressive ear, sense of rhythm, analytical ear, architectonic ear, and productive-music ability.

Regarding musical intelligence, Gardner (1993) theorizes that it consists of the subject's ability to apprehend and process sounds and rhythms, that is, the per-

ceptual musical elements, as they manifest the ability to learn music, even in an autonomous way.

Gordon (2000) affirms, "[a]udiation, as you should remember, is for music what the thought is for language" (p. 70.) and that hearing is fundamental for musical aptitude and, consequently, for the musical performance.

In this sense, Gordon (2015) argues that there are 20% of children in public and private schools with a high level of musicality, who are not identified by their teachers, including specialists in the field of Music. For him, human beings will stand out in some area of knowledge, therefore, the importance of helping children in the early discovery of their potential.

Perceptual musical abilities (sensory route) are amenable to measurement, because of that, Gordon (2000), Seashore (1938) and Wing (Sloboda, 2008), among other authors, created their own standardized instruments. These authors made use of the Psychophysical structure, using the peer comparison method.

Psychophysics operates in a predictive way in the manner human beings perceive and process sound at a cognitive level (Manning, 1974; Roederer, 2002). When organized in pairs (different and equal), individuals from a sample may have the chance to recognize the stimuli in an estimate of 50% (Manning, 1974). Therefore, the subject's response to stimuli can be verbal or gestural (Manning, 1974).

Given the characteristics of the psychophysical method of comparison by peers and the need for preliminary identification of musical talent, it was necessary to detect which dimensions would allow to reach this end.

It was with this aim in mind that dimensions were selected for the construction of the Protocol for Screening Musical Abilities (PSHM)[3] to meet the demand for a standardized instrument composed, in its preliminary version, by two abilities, eight dimensions (timbre, pitch, melody, intensity, harmonic, duration, sense of time and rhythmic pattern) and each has pairs of items that, added up, total 127 pairs (Koga, 2019) (Table 1).

Table 1
PSHM - version under construction (appendices 1, 2, 3, 4 and 5)

ABILITIES	DIMENSIONS	ITEMS
Sensory-perceptual	1 – Timbre	15 pairs
	2 – Pitch	18 pairs
	3 – Melody	14 pairs
	4 – Intensity	11 pairs
	5 – Harmonic	20 pairs

3 This acronym was kept in Portuguese/Brazil due to the patent granted to it making its alteration or translation unfeasible (authorization: 917778731 – Instituto Nacional da Propriedade Indústrial/INPI).

Table 1 (Continuation)
PSHM - version under construction (appendices 1, 2, 3, 4 and 5)

ABILITIES	DIMENSIONS	ITEMS
	6 - Sense of time	16 pairs
Rhythmics	7 - Duration	19 pairs
	8 - Rhythmic pattern	14 pairs

Note: Abilities, dimensions and pairs extracted from Koga (2019, p. 115).

For the PSHM to achieve this construction, it was necessary to carry out the process of selecting the dimensions so that the items could be elaborated. In this perspective, the question that arose was: what dimensions would be necessary to compose the instrument[4] and are they able to track musical talent in an initial way?

In view of the questioning established, the objective of this study was to present how and what dimensions were elaborated for the construction of items of the Protocol for Screening of Musical Abilities (PSHM) and the results will be discussed and supported in: Borland and Wright (2004), Gordon (1986, 2000), Hutz et al. (2015), Kirnarskaya (2004, 2013), Lehmann et al. (2007), Pasquali (2013), Roederer (2002), Seashore (1938) and Teplov (1966). The method of this study is presented in the next item.

Method

It is an exploratory research, which aims to "[...] gather information about a certain object, thus delimiting a field of work, mapping the conditions of manifestation of that object" (Severino, 2007, p. 123).

The study has two stages. The first was a systematic review of the literature (SRL) due to the need to track which dimensions would allow to reach the characteristics of music talent and which would fit the psychophysical method of comparison by peers. The review was chosen based on studies by Medrado et al. (2014). The authors argue that the SRL consists of mapping, arguing, integrating, and critically evaluating the interpretation of the data generated by the research activity, in any area, referring to a problem that requires a solution from the researcher.

In this stage of the research, the databases were listed: Sage full-text collection, Resources in Education and Current Index to Journals in Education (ERIC), Brazilian

4 The word instrument is being used in this text not as a musical instrument (piano, guitar, flute, others), but as a synonym for standardized Scale and Scale does not consist of the musical (Do major, Re minor, etc.), but the structure that it allows measuring phenomena such as talent (Pasquali, 2013).

Digital Library of Theses and Dissertations (BDTD) and the Amplificar database. In addition, two qualified international magazines in the Music area were consulted: "Music Perception"[5] and "Psychology of Music"[6] , as advised by Lehmann et al. (2007)[7].

The term "music abilities"[8] was used, selected from the studies of Gordon (2000), Haroutounian (2002), Kirnarskaya (2004), Seashore (1938) and Teplov (1966).

The last 20 years were considered for the tracking of productions in the referred data portals; however, due to the low occurrence of findings, previous periods were revised as a way to expand the search.

In the second stage, the dimensions were subjected to semantic analysis by expert judges. In this type of analysis, the judge assesses whether the dimension is an adequate representation of the latent trait (Pasquali, 2010, 2013; Hutz et al., 2015). They were responsible for judging the relevance of the dimensions, the cultural aspects, inference of the measurement potential, if the dimensions were subject to submission to the psychophysical method and the technique for screening[9] and if it would be possible to elaborate controlled pairs of items, based on the dimensions selected.

Therefore, the two groups of experts were constituted as follows: the first by academics and/or researchers in the Music field and the second by teachers in the discipline of Music Education.

Then, a spreadsheet containing the dimensions and alternatives was made available to the judges, which varied in Y (yes), IDK (I do not know) and N (no), so that they could point out the answer with an "X". There was an explanatory statement and instructions on how they should proceed, as well as a field for the judges to register their opinions and suggestions.

In a spreadsheet, the total N of relevant works found with the items was recorded: title of works, abstracts, date, authorship, and origin. For that, they needed to focus on music abilities, contain standardized tests and have used the psychophysical method of peer comparison, in addition to the screening technique.

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5 "Music Perception": http://mp.ucpress.edu/

6 "Psychology of Music": http: //journals.sagepub.com/home/pom

7 Evidently, there are other databases as well as journals that allow other results to be reached, but it should be noted that the data presented in this research result from a methodological choice and design.

8 Attempted to translate the word "skills" from a musical perspective. The base the authors studied are Russian (with English and French translation) and American. In English, the word "habilidades" can be written as "skill": "expertise" and "ability", or "ability": ability, aptitude, power, skill, proficiency and talent, according to the English-Portuguese dictionary Webester's (6th ed.) (Houaiss, 2007). We chose to use the word "ability".

9 The screening technique has its origins in the health area. It is a mass screening that aims to raise the hypothesis about the sample (Borland & Wright, 2004).

The second stage was to submit the selected dimensions of the productions found to the analysis of eight (8) judges specialized in Music, divided into two groups, namely: teachers/researchers (4) and teachers of music education in basic education (4). After the return of the analyzes, the data were tabulated, for which identification numbers were assigned to the dimensions (1, 2, 3, 4 ...) and numbers for the answers such as, yes = 1, I do not know = 2 and no = 3. Based on the recommendations of Pasquali (2010, 2013) and Hutz et al. (2015), the agreement index was established, which were standardized by Hutz et al. (2015, p. 76), as can be seen in Table 2.

Table 2
Minimum values for Content Validity Ratio (CVR)

Number of Judges	CVR
5	0.99
6	0.99
7	0.99
8	0.75
9	0.78
10	0.62
11	0.59
12	0.56
13	0.54
14	0.51
15	0.49
20	0.42
25	0.37
30	0.33
35	0.31
40	0.29

Note: Cut off parameter extracted from the studies by Hutz et al. (2015, p. 76).

Since eight judges were invited, the agreement index should be 0.75. Pasquali (2013) argues that: "[...] if item 1 was marked by eight out of ten judges as representing the autonomy factor, then he managed to agree 0.80 (8/10) and is retained in the cast" (p. 108). In this research, if six indicate "yes" in one item, it will have obtained an agreement of 0.75 (6/8). It was based on the cuts that the construct analysis was carried out.

The third group was composed after the feedback of the eight (8) expert judges in the music field. Despite their musical knowledge, the judges in the music field highlighted doubts regarding the dimensions to adapt to the psychophysical method of comparison by peers and the technique for screening. For this reason, they recom-

mended a third assessment made up of scholars in psychophysics and screening. At that time, the dimensions selected by the music judges were submitted to the appreciation of the specialized research group in the construction of standardized scales so that they could judge the dimensions in relation to the PSHM construction structure.

In summary, given all that has been mentioned, Figure 1 concatenates and represents all the steps taken in the procedure of this research.

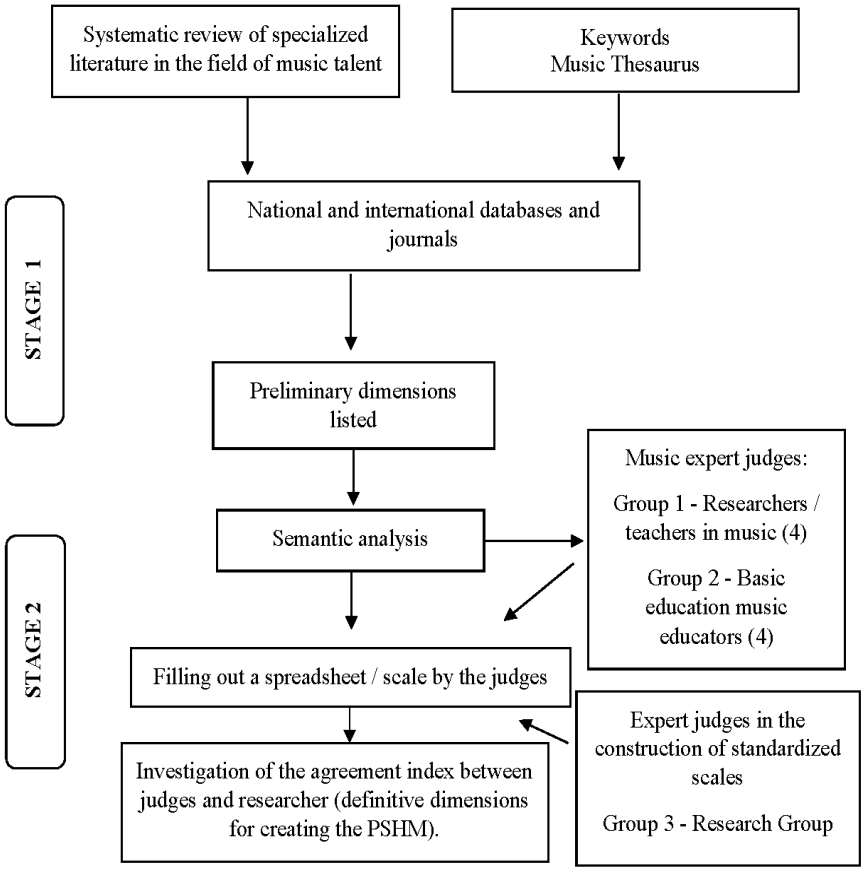

Figure 1. *Steps in the selection dimension procedure for the construction of the PSHM.*

The results of the selection of dimensions for the composition of the PSHM will be presented below together with discussion.

Results and discussion

With the systematic review carried out in the first refinement stage, the surveys considered relevant for this study were:

Chart 1
Summary of relevant research to the present study

Base	Standardized instrument	Authorship
AMPLIFICAR	Montreal Battery of Evaluation of Amusia;	Peretz et al. (2003);
	Musical Skills Battery;	Wise & Sloboda (2008);
	Teste de Amplitude Melódica and Teste de Memória Operacional tonal.[10]	Werke (2012).
BDTD	Avaliação de habilidades musicais para adolescentes com a síndrome de Willems[11].	Asnis (2014).
ERIC	Absorption in Music Scale (AIMS);	Sandstrom & Russo (2011);
	The High/Scope Rhythmic Competence Analysis Test;	Weikart (1987);
	The Gross Motor Development test 2;	Ulrich (2000);
	The Musical Ear Test (MET).	Wallentin, Nielsen, Friis-Olivarius, Vuust & Vuust (2010).
MUSIC PERCEPTION	Pitch Identification Test (PIT) and Pitch Adjustment Test (PAT);	Dohn et al. (2014);
	Complex Beat Alignment Test (cBAT) and Parental Questionnaire.	Einarson & Trainor (2016).
PSYCHOLOGY OF MUSIC	Musical Aptitude Profile;	Gordon (1965);
	Musical Ear Test;	Thomas et al. (2015);
	Measure of Musical Abilities (MMA).	Bentley (1966).
SAGE	Primary Measures of Music Audiation (PMMA).	Gordon (1986).

Note: Only the instruments and their authors whose research was found during SRL are listed in the table.

When analyzing the dimensions and items of each standardized instrument in Chart 2, it was possible to preliminarily list the dimensions related to sensory and rhythmic perception, which were usually used in situations of auditory discernment, as can be seen in the studies of Bentley (1966), Dohn et al. (2014), Einarson and Trainor (2016), Gordon (1965, 1986), Peretz et al. (2003), Thomas et al. (2015) and Wallentin, Nielsen, Friis-Olivarius, Vuust and Vuust (2010). The other instruments, from other research, addressed aspects of a more general order such as motor coordination, memory, creativity, and motivation (involvement with the task).

10 Melodic Amplitude Test and Tonal Operational Memory Test – This is a translation only for reading purposes in English.

11 Musical skills assessment for adolescents with Willems Syndrome – idem.

It was possible to find researches by the systematic review made, such as that in Chart 2, and, thus, select musical skills that fit the structure of dimensions, making it possible to indicate the phenomenon of musical talent (Teplov, 1966). In addition, it was necessary to consider aspects of the culture and the psychophysical method of peer comparison (Pasquali, 2013; Roederer, 2002).

The Chart 2 summarizes the main dimensions found in the surveys and which were appreciated by the judges.

Chart 2
Dimensions selected by the author and the judges

Dimensions selected by Systematic review		Dimensions selected by judges
Perceptual/sensory	1 – Timbre	Accepted
	2 – Pitch	Accepted
	3 – Intensity	Accepted
	4 – Isolated notes	Refused
	5 – Melody	Accepted
	6 – Harmonic	Refused
	7 – Polyphony	Refused
Rhythm	8 – Pulse Perception	Refused
	9 – Sense of time	Accepted
	10 – Duration	Refused
	11 – Recognize patterns	Accepted
Creation	12 – Improvisation	Refused
	13 – Composition	Refused
	14 – Imagination	Refused
Memory	15 – Music memoryability	Refused
Motor	16 – Visuomotor	Refused
	17 – Bimanual	Refused
	18 – Audio-motor	Refused
	19 – Laterality	Refused
	20 – Global	Refused
Task commitment	21 – Intrinsic motivation	Refused
	22 – Extrinsic motivation	Refused
	23 – Perseverance	Refused
	24 – Compulsive need to learn	Refused
	25 – Fury to master	Refused
	26 – Motivation	Refused

Note: The table shows the selection made by the author and then the one made by the judges.

In order to calculate the judges' responses, the number of options was recorded (yes = 1, I do not know = 2 and no = 3), the frequency of responses was calculated,

generating the raw score, and the percentage of favorable responses (equal or above 75% in the "yes" option).

Table 3

Result of the construct analysis

ITENS	J1	J2	J3	J4	J5	J6	J7	J8	RAW SCORE			PERCENTAGE		
									Y	IDK	N	Y	IDK	N
1	1	1	1	3	1	1	1	3	6	0	2	75	0	25
2	1	1	1	1	1	1	1	1	8	0	0	100	0	0
3	1	1	1	1	1	1	1	1	8	0	0	100	0	0
4	1	3	3	1	3	1	2	3	3	1	4	37.5	12.5	50
5	1	1	1	1	1	1	1	1	8	0	0	100	0	0
6	1	1	1	1	2	1	2	1	6	2	0	75	25	0
7	1	2	1	3	2	2	2	3	2	4	2	25	50	25
8	1	1	1	1	1	1	1	1	8	0	0	100	0	0
9	1	1	1	3	1	1	1	1	7	0	1	87.5	0	12.5
10	1	1	1	1	1	1	1	1	8	0	0	100	0	0
11	1	2	1	1	1	1	2	1	6	2	0	75	25	0
12	1	1	1	3	1	1	1	1	7	0	1	87.5	0	12.5
13	1	2	1	1	1	1	1	3	6	1	1	75	12.5	12.5
14	1	1	1	3	1	1	1	1	7	0	1	87.5	0	12.5
15	1	1	1	3	1	1	1	1	7	0	1	87.5	0	12.5
16	1	1	1	1	2	1	2	1	6	2	0	75	25	0
17	1	2	1	1	1	1	2	1	6	2	0	75	25	0
18	1	1	1	1	1	2	2	1	6	2	0	75	25	0
19	2	1	1	3	2	1	2	1	4	3	1	50	37.5	12.5
20	2	2	1	3	1	1	2	1	4	3	1	50	37.5	12.5
21	1	1	1	1	1	1	1	1	8	0	0	100	0	0
22	1	1	3	1	1	1	1	1	7	0	1	87.5	0	12.5
23	1	1	1	1	1	1	1	1	8	0	0	100	0	0
24	1	3	1	3	2	3	2	3	2	2	4	25	25	50
25	3	3	1	3	2	3	2	3	1	2	5	12.5	25	62.5
26	3	1	1	1	1	1	1	1	7	0	1	87.5	0	12.5

Note: J - judge; Y - yes = 1, IDK - I do not know = 2 and N - no = 3.

To check the agreement indexes, Kendell's tau b statistical test was applied. It was from the correlation in Kendell's statistical test that the items were definitively constituted.

The results showed that some judges correlate in their answers significantly and in other ones not so much, which demonstrate the need to review some items still. The Table 4 presents them.

Table 4
Results of the Tau b Kendell

		J1	J2	J3	J4	J5	J6	J7	J8
J1	Correlation coefficient	1	0,190167	-0,12039	0,296721	0,194546	0,152174	0,259725	0,038069
	Sig. (2 extremities)	0,316349	0,539667	0,130617	0,313892	0,429596	0,185771	0,846217	
	N	26	26	26	26	26	26	26	26
J2	Correlation coefficient	0,190167	1	0,171701	0,175549	,431*	,471*	,599**	,659**
	Sig. (2 extremities)	0,316349		0,374545	0,363933	0,023686	0,013021	0,001954	0,000656
	N	26	26	26	26	26	26	26	26
J3	Correlation coefficient	-0,12039	0,171701	1	-0,22822	0,220366	-0,12039	0,044947	0,184466
	Sig. (2extremities)	0,539667	0,374545		0,253833	0,262871	0,539667	0,822187	0,356356
	N	26	26	26	26	26	26	26	26
J4	Correlation coefficient	0,296721	0,175549	-0,22822	1	0,201166	0,32969	0,123091	0,317543
	Sig. (2extremities)	0,130617	0,363933	0,253833		0,306744	0,093028	0,538253	0,112351
	N	26	26	26	26	26	26	26	26
J5	Correlation coefficient	0,194546	,431*	0,220366	0,201166	1	,433*	,693**	,503*
	Sig. (2 extremities)	0,313892	0,023686	0,262871	0,306744		0,024893	0,000427	0,010555
	N	26	26	26	26	26	26	26	26
J6	Correlation coefficient	0,152174	,471*	-0,12039	0,32969	,433*	1	,487*	,533**
	Sig. (2 extremities)	0,429596	0,013021	0,539667	0,093028	0,024893		0,013102	0,006622
	N	26	26	26	26	26	26	26	26
J7	Correlation coefficient	0,259725	,599**	0,044947	0,123091	,693**	,487*	1	0,270054
	Sig. (2 extremities)	0,185771	0,001954	0,822187	0,538253	0,000427	0,013102		0,176929
	N	26	26	26	26	26	26	26	26
J8	Correlation coefficient	0,038069	,659**	0,184466	0,317543	,503*	,533**	0,270054	1
	Sig. (2 extremities)	0,846217	0,000656	0,356356	0,112351	0,010555	0,006622	0,176929	
	N	26	26	26	26	26	26	26	26

Note: *. The correlation is significant at the level 0,05 (2 extremities);

**. The correlation is significant at the level 0,01 (2 extremities);

The calculation of the agreement index made it possible to conclude that the dimensions with the lowest agreement index were: isolated notes, polyphony, laterality, global motor coordination, compulsive need to learn and fury to master. For this reason, they were excluded, while the dimensions with greater agreement were maintained. In addition, in the field of suggestions, the judges reported that, except for isolated notes, the other items could be worked on later evaluation batteries, due to their nature.

After analyzing the results, it was concluded that the item isolated notes was confused with pitch, because, fundamentally, it is the use of musical notes. For the judges, pitch was a more significant item due to its interval relationship (direction of notes) (Gordon, 2000). Presenting isolated notes might not make sense to the participant. Labeling sounds, according to Levitin (2006), is not synonymous with indicative of musical talent, although there are people with perfect pitch capable of carrying out this task. However, people with musical talent may have a great ability to discern pitch and not have a perfect pitch (Teplov, 1966).

Polyphony was considered an extremely difficult item to perform screening; as well as laterality and global motor coordination. The judges indicated that these three items could be well explored in later evaluation batteries. After all, the screening is initial and may not require a great musical experience from the individuals who will perform it. The evaluative screen, in this type of phase, cannot be overly demanding. The objective is to recruit the greatest number of possible potential cases so that, thus, they can be referred to evaluation batteries (Borland & Wright, 2004).

Regarding the compulsive need to learn and the fury to master, the judges deemed to be equivalent items and considered it unnecessary to assess these dimensions at the moment of screening. They pointed out that the musical practice of doing or performing musically is necessary, so that this type of dimension can be observed.

The second analysis of the construct was performed with group 3, in order to judge the capacity and possibility of grouping the dimensions in pairs (Pasquali, 2013; Roederer, 2002). From this refinement the dimensions that remained were: perceptual/sensory abilities (pitch, intensity, melody, timbre and harmony) and rhythmic abilities (duration, rhythmic patterns and sense of time) (Chart 3).

Chart 3
Example of exercises organized in pairs

Example: dimension timbre	
Pairs	
Piano versus Piano (same)	Guitar versus Violin (different)
After hearing the two sounds (one pair at a time) the participant answered	

Note: How item pairs were organized

These dimensions allow the association with elementary and superior auditory aptitudes (expressive ear, sense of rhythm, analytical ear, architectonic ear and productive-musical ability), according to the theoretical foundations of Gordon (2000), Kirnarskaya (2004) and Teplov (1966), for this reason, make it possible to infer that, when measured, they can indicate musical talent initially, since these dimensions are considered one of their bases for musical aptitude (Gordon, 2000; Teplov, 1966). In addition, all of them allow you to create exercises in pairs of sound stimuli for mass application.

The researches by Gordon (1986), Morrongiello et al. (1985), Peixoto et al. (2012) and Pessato et al. (2012) confirm and corroborate the results mentioned above, since they bring research results with standardized instruments built on similar grounds. In this way, it was possible to compare the results of the analysis made by the groups of judges, the mentions of the researchers and the theoretical basis from the search carried out.

In summary, there are dimensions that do not allow structuring in pairs of sound stimuli, but that does not mean that they should be discarded. They can be better explored in other evaluative batteries that suit the way they are used. Creativity is an example, because its manipulation in the structural format of the PSHM becomes impracticable, but its investigation is essential to evaluate musical talent. The same occurs with motivation, involvement and practical musical abilities. They are considered important elements for the area of music and can be better explored in surveys of a qualitative nature through practical musical activities/performances, which allow the observation of the evaluator, interviews, descriptions, among other strategies can be adopted, when there are few participants. Generally, this qualitative step is that of assessment, when broad screening with a larger number of participants has been carried out previously. Assessment is a more individualized step (Borland & Wright, 2004). The identification procedure is recommended to be broad and encompassing several participants, while the evaluation is recommended to be carried out with those who were indicated during the more general identification screening (Borland & Wright, 2004).

As a way of exemplifying the selection of dimensions, Seashore (1938) becomes an example. Creator of an instrument to track musical talent through elementary sensory abilities, which are pitch, intensity, duration, rhythm, timbre, harmony as well as imagination, creation, motricity, simple melodies, and so on, developed a psychometric test along the lines of the psychophysical method of peer comparison. The difference between it and what is related to the PSHM lies in the fact that the PSHM is a standardized tracking instrument, which raises hypotheses or possible

cases considering them as potential and that deserve to be evaluated (Appendices 1, 2, 3, 4, 5). While Seashore's (1938) aims to evaluate and issue an affirmative answer regarding the presence or absence of musical talent in a given subject.

Although the measurement of musical talent can be complex and involve other nuances and possibilities of measurement, as mentioned above, musical talent is a measurable phenomenon and an auditory route would be one of the possibilities of its apprehension due to the possibility of creating objective tasks that allow its empirical apprehension (Pasquali, 2013; Teplov, 1966).

In this same perspective of composing tasks to measure the phenomenon of musical talent, Gordon (2000) created a series of standardized instruments to track the auditory acuity levels of students with two dimensions, which are: notes (short melodies) and rhythms.

For him, the creation of these instruments is justified in the fact that there will be children capable of developing musically in an earlier way when compared to their peers. For this reason, the construction of standardized instruments that measure this condition makes it possible to contribute to improving the musical formation of the child in a more targeted way, because they become a starting point for the educator to adapt musical teaching to the strengths and weaknesses of the student. For this author, the reason why only two musical aptitudes (tonal and rhythmic) in development were identified possibly lies in the fact that children are little focused on the musical nuances that vary, but they are interested in the musical stimulus itself (Gordon, 2015).

Although there are standardized instruments such as those by Seashore (1938) as well as those by Gordon (2000) and other contemporary authors, their use in the Brazilian reality is not viable due to musical differences. Brazilian music is made up of distinct melodic rhythms and the rhythmic aspects have very peculiar accents and interpretive forms. As much as it can perform a cultural adaptation and validation of the existing standardized instruments for this reality, there would be differences and peculiarities of the musical elements that would not be contemplated.

Finally, the conclusion of the study comes next.

Conclusion

The choice for tracking, based on the perceptual-sensory route, as did Gordon (2000) and other authors presented in this study, consists of seeking sound exercises with characteristics that allow the control of stimuli in a standardized way and

their organization in pairs of sounds for discernment and that can be performed in a classroom, for example, with all children together and simultaneously.

Although PSHM is a standardized psychophysical scale, which uses sound stimulus as a way to analyze the perceptual-sensory route, it was not designed to determine whether a subject is talented for music or not, but to highlight possible cases of talent that may or may not come to be confirmed in other complementary and more in-depth evaluative batteries.

The PSHM allows reaching a large number of subjects, through the psychophysical scale, which has not been favorable in other assessment instruments, because they demand time and space for application, as well as time for analysis, making it unfeasible for the Brazilian school context. Thus, it is inferred that the greater usability and validity of a Scale, the better it will be to carry out the identification process at school.

It is known that in some circumstances there is incipience in the standardized instruments that aim at objective measurement, but, considering an initial identification process that precedes several subsequent traces until evidence can be affirmed, this type of standardized Scale can collaborate in the mapping of large quantities of students to subsequently evaluate them individually.

There are many standardized Scales that have been built and used, often in the wrong way; for this reason, it cannot be considered as the only way to identify talent, especially the musical. There is no doubt that this talent has multiple nuances, one of the most important perhaps being creativity, however, within the parameters that allow meeting the demand for initial identification and the reality of Brazilian schools, the perceptual sensory dimensions still seem to be the ones that fit the researched reality.

The PSHM is expected to be considered as a preliminary mapping that raises possible cases that deserve further investigation. It is understood that the sensory perception route is not the only one that determines talent, however important, which Seashore (1938) and Gordon (2000) considered the basis for accessing musical talent.

PSHM not only detects musical talent but collaborates with the Brazilian scenario of instruments used for this purpose, given the scarcity of this type of identification in schools. We conclude that it is necessary to extend the sample for validation and to extend the scope of the instrument to other school grades and ages.

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Ethics

This research was submitted to the Brazilian Ethics Committee of the Faculty of Philosophy and Sciences, UNESP, Marília, São Paulo, Brazil, with a favorable opinion to be carried out, based on the document: CAAE52337415.9.0000-5406.

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