

## Preliminary Study on Developing Protocol for Music Therapy Assessment for Cognitive and Emotional-Behavioral Domain using Rhythm (MACED-Rhythm)\*

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Assessment in music therapy is a vital part for both the therapist and client in the process of therapy. Based on what is assessed, objectives are identified to formulate specific action procedures and strategies. The existing assessment tools involve lists of skills and behaviors in developmental domains without the music assessment protocol. In this study, the authors attempted to develop an assessment protocol using rhythm production for assessing skills in cognitive and emotional-behavior domain, namely Music Therapy Assessment for Cognitive and Emotional Behaviors (MACEB). The test items of the MACEB-Rhythm were developed using rhythmic patterns varying in terms of item difficulty, which are based on the various degree of clarity in the grouping/gestalt, saliency in part-whole relationship, and complexity in repetition vs. variability. Also the developed tool purported to examine one's level of emotional behavior trait by analyzing performance of musical parameters such as tempo, pacing, and loudness in the reproduced output. In order to verify the logical sequencing of test items, firstly 61 subjects participated in verifying the item difficulty for the selected 15 pilot items. The test items were revised and re-sequenced based on the gathered scores of item difficulty. In the second procedure, seven experts in the fields of music education, music therapy and music psychology whose research interest lie in music cognition revised the developed rhythm protocol items focusing on learning sequence, cognitive process and feasibility for skills assessment. The study attempted to provide foundations for using rhythm as an assessment protocol prior to its verification of assessment validity and reliability.

*Keyword : Music therapy assessment, Cognitive, emotional, behavioral domain, Rhythm assessment protocol*

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## 인지 및 정서행동 영역에서의 음악치료 사정을 위한 리듬 프로토콜(MACED-Rhythm) 개발 예비 연구\*

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정현주\*\*\*

음악치료에서 사정평가는 내담자의 현재 기능과 필요를 파악하기 위하여 반드시 선행되어야 하는 과정이다. 음악치료사는 사정평가의 내용을 바탕으로 치료목적 및 목표를 설정하고 이를 달성하기 위한 단계적 접근과 치료전략을 수립한다. 하지만 기존의 음악치료 사정도구는 해당 영역의 행동을 열거하고 이를 관찰하여 수치화함으로써 기능을 평가하였기 때문에, 실제 인간의 음악행동을 통한 기능의 사정이 불가능하다는 단점을 지니고 있다. 또한 음악행동을 바탕으로 하는 소수의 음악치료 사정도구에서도 음악행동을 구성하는 세부기능영역, 발달단계에 따른 근거에 따른 난이도 검증 과정을 거치지 않고 사용되어 왔다. 본 연구에서는 인지기술 사정을 위한 리듬 요소군을 중심으로 한 음악 프로토콜 문항을 개발하였으며 발달학적 근거와 인지기술 수준에 따른 난이도 요소를 규명하고자 하였다. 인지발달에 따른 소리정보의 그룹핑, 구조형식의 수준, 전체-부분 관계의 명료성, 반복-변동성 수준을 고려한 리듬 연주 항목과 연주행동에 내포된 정서 행동을 분석할 수 있는 리듬 사정 프로토콜을 개발하였다. 검증과정으로는 먼저 15개의 예비 리듬 문항을 난이도, 복잡성, 패턴 유형을 고려하여 선정한 후 이를 일반인 61명을 대상으로 난이도 검증을 실시하여 문항별 수준과 난이도 계수를 도출하였다. 둘째, 7인의 전문가 평가팀의 검증을 통해 1차 개발된 문항들을 수정 보완하여 최종적으로 20개의 리듬프로토콜 문항을 개발하였다. 본 연구의 결과는 이후 개발될 음악치료사정평가지도구의 기초 자료로 활용될 수 있다.

핵심어: 음악치료사정, 인지기술, 정서 행동 기술, 리듬 사정 프로토콜

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## I . Introduction

Assessment in music therapy is a vital part for both therapist and clients in the process of therapeutic intervention. Assessment in music therapy involves identification of client needs through observed weaknesses and strengths by gathering sufficient amount of information both inside and outside of music therapy environment. Accurate information is crucial in formulating efficient interventions. Based on what is being assessed, specific action procedures and strategies are formulated (Bruscia, 1987; Wigram, Pedersen & Bonde, 2002; Hanser, 2000).

In music therapy, assessment is used to obtain evidence supporting the value of music therapy as an intervention. In music therapy assessment, the therapist is central to the assessment process, since the therapist's subjective evaluation influences what and how the assessment is administered. Many of them rely on subjective opinion, involving observer reliability (Wigram et al, 2002). Usually one or more types of tools are used for evaluation in developmental domains such as psychological, emotional, communication, and social. Depending on the clinical setting and practical environment, various types of assessment tools were used varying from general tools to standardized tools.

The earlier developed assessments include music therapy assessment for children with developmental disability (Bitcon, 1976), Nordoff-Robbins assessment scale (Nordoff & Robins, 1977), assessment of cognitive functioning (Rider, 1981), clinical and educational use of Orff-schulwerk (Boxil, 1985), assessment of musical interaction (Pavlicevic, 1995), cognitive, perceptual, motor and visual skills, and sound-musical profiles (Di Franco, 1999). For psychiatric setting, the frequently used tools include music psychotherapy assessment (Loewy, 2000), music therapy assessment for disturbed adolescents (Wells, 1988), and psychiatric music therapy questionnaire (Cassity & Cassity, 2006). For geriatric population, assessment tools involve geriatric music therapy assessment (Hintz, 2000), music assessment of gerontological needs and treatment (Adler, 2001), and Ewha music therapy assessment tool (Chong, 2004).

According to the survey administered by Chase (2004), the music therapy assessment tools used in various settings have specific characteristics. Tools were either provided as rating scale for recording behavior, or collect data by directly observing client's behavior using the tool to identify specific observable behavior to be assessed. The tools were usually in a checklist format for recording client responses using symbols (-, +, etc) or words (e.g,

presence-absence, yes-no). Typically the behaviors in developmental domains are recorded and interpreted by the therapist. Due to much subjectivity and selective orientation of the assessment areas, music therapy assessment tools have difficulty with generalization or standardization. This is especially the case when the tools involve qualitative data for description.

What is common in these assessment tools are that they are domain or behavior oriented. The tools and scales provide ideas and behaviors as to what to observe and what skills to record, however, what they lack is the music protocol which needs to be utilized in the process of its assessment. Therefore, what is imperative is a musical protocol that can be used in the assessment process. In this study, the authors attempted to develop music assessment protocol with rhythm items based developmental ability involved in executing the rhythm tasks for assessing skills in cognitive and emotional behavioral domain.

## **II. Development Rationale for Rhythm Protocol for Cognitive Skills and Emotional Behavior**

Among many developmental domains, cognitive skill areas have firm relationship with music processing and music making experience. Especially for assessment of cognitive skills, music is composed of complex combinations of sounds, grouped into information units, presented over time. It requires a high level of mental task to hold immense amount of auditory information provided in the flow of time and be able to make musical meanings out of what is heard (Deliege & Sloboda, 1996; Handel, 1993).

Firstly, one can assess temporal and spatial reasoning (Drake & Palmer, 2000). Ability to perform a succession of regulated recurring beats requires temporal accuracy and its reproduction requires gross-motor skills as well (Derri et al, 2001). Rhythm is the periodic succession or regular recurrence of events in time which constitute the organization of temporal relationships. It has also been assumed that rhythm can be perceived in various ways, since all of the senses are capable of experiencing rhythmic organization of sensations.

Rauscher and others (1993; 1995; 1997) over several years and in repeated studies have shown meaningful effects of music training on spatial-temporal reasoning, leading to the "trion" model of the cortex. This theory suggested that musical and spatial processing centers

in the brain are proximal or overlapping and hence linked, rather than being entirely distinct as predicted by modular theories of the mind. The researchers hypothesized that because of neurological connections in the cortex, the development of certain kinds of musical and spatial abilities are related.

Understanding the meter system using temporal reasoning, and tonal sequences forming melodic phrases and its occurrence such as, repetition or variation utilizing spatial reasoning skills are vital cognitive skills in music. Therefore, the ability to reproduce rhythmic and melodic phrases provides information on one's temporal and spatial reasoning skills.

Secondly, one can assess gestalt perception by examining the grouping tasks in rhythmic and tonal patterns. Grouping tasks in rhythmic and melodic patterns involve identifying part-whole relationship in the patterns. Organizing sound elements with one another to form a coherent whole is a high-level mental ability (Sloboda, 1985). Sorting out the auditory information between figure and ground, and grouping or "chunking" the message by meaningful units involves cognitive skills to comprehend the musical units and make relationships among them. Such processing of auditory grouping mechanism employs several Gestalt principles such as the principles of proximity, continuity, closure, and constancy (Drake, 1998; Handel, 1993; Lerdahl & Jackendoff, 1983).

Establishing auditory gestalts is associated with attention ability in particular. While organizing sounds into perceptually meaningful units, listeners are attending to salient features of musical sounds. As the formation of auditory gestalts is continuously maintained over time, listeners tend to establish separate sound streams, called auditory scene analysis (Bregman, 1994).

Thirdly, one can assess short-term memory skills through rhythm playing. Memory is a mental system that receives, stores, organizes, alters and recovers information from sensory input (Coon, 1997). Short-term memory is defined as a system for temporarily storing and managing information required carrying out complex cognitive tasks such as learning, reasoning, and comprehension. It is involved in the selection, initiation, and termination of information-processing functions such as encoding, storing, and retrieving data (Cowan, 2001).

Musical perception occurs in various levels ranging from simple auditory perception of sound stimulus to a complex level of perception, where melodic and rhythmic transformation, musical form, and stylistic characteristics are recognized (Swartz, Hantz, Crummer, Walton, & Fristina, 1989). Recognizing the perceived musical information and

ability to store the processed music information for short term is vital part in cognitive functioning. The only way to evidence the short-term memories to have them reproduces what has been presented.

Lastly, task completion in music performance refers to one's ability for attention span. For task completion, one's extension of attention and its maintenance play a vital role (Bigand, McAdams, & Foret, 2000). This attentiveness executed by voluntary intention. According to Snyder and Alain (2007), frequency-based segregation occurred pre-attentively and time-based segregation is followed with conscious effort, intention for sustained attention in music listening. For tonal music, listeners can track melodic lines or its contour among other musical textures (i.e., homophony, polyphony) extending their attention span.

Based on the literature that explain the relationship between one's rhythmic responses and the energy level, one's emotional state such as hyperactiveness can be measured through rhythm task. According to Bruscia's Improvisational Assessment Profile (1987), one's musical response in rhythm manifests one's energy level. The levels of subdivision are indicative of one's energy level. The tempo is considered to be the gauge of the energy level: faster tempo indicates increased activity, whereas slower tempo indicates decreased activity. Using this concept, some of the studies have utilized music as a major intervention for children with emotional and hyperactive behaviors (Cripe, 1986; Montello & Coons, 1998; Rickson & Watkins 2003) Bruscia's Improvisation Assessment Profiles (IAPs) (1987) have been used in relatively few studies, and Wigram et al, (2002) has used the IAPs as a diagnostic tool in assessing children with developmental problems. He found that the focus on the musical events in the IAPs allowed substantial and important differences to emerge that had not been observed in other assessment processes.

### **III. Procedures of Developing Rhythm Protocol for Assessment**

For developing assessment protocol using rhythm components, rhythm was defined as placement of beats with certain temporal time distance among the beats (Bruscia, 1987). Within this component are the sub-components such as rhythmic ground, rhythmic figure, subdivisions of pulse, meter, and tempo that formulate the rhythmic schema (Chong, 2010). Items were developed based on complexity and information processing skills of gestalt concepts. The level of items differed by levels of consistency, repetition vs. variability,

grouping, coherence in part-whole relationship, etc. Items in each section are sequenced in a logical way referring to the comprehensive capacity of the clients in mental development. The items for the tests are sequenced from low to high complexity.

## 1. Procedure 1: Development of Pilot Rhythm Items for Assessment Protocol

### A. Pilot Rhythm Items

In the process of development, existing earlier works on the music aptitude tests are referred including Gordon's Music Learning Theory(1980), Bloom's Taxonomy (1956), and Gordon's structure of the Iowa Test of Music Literacy (ITML) (1970). Items are sequenced in a logical way, for example from easy to complex. Participants are able to perform the items without any cognitive challenge at the beginning of the test.

The rhythm protocol is developed with a firm basis on the existing literature on the relationship between music and cognitive skills. Each level of the ITML progresses from simple to complex in a manner that is very similar to Bloom's Taxonomy. As the simple tonal and rhythmic patterns progress from simple forms to more complex ones, Gordon is following the hierarchical patterns of Bloom (Gordon, 1989). In the earlier study by Rider (1981), he used music perception for assessment of cognitive function levels in children between age of 2 and 12, based on Piaget's cognitive development staging. Music Assessment of Cognitive Development (M-PACD) was developed and used, which is comprised of the following 15 tasks: two-beat cadence, loudness discrimination, matching, imitative imagery, deferred imitative imagery, creative mental imagery, tempo discrimination, duration discrimination, seriation of tempo and duration, class inclusion, conservation of rhythmic pulse, conservation of auditory number, conservation of tempo, and duration. In this developed rhythm protocol, an item begins with simple moves to more complex rhythms, much in the way that Bloom's Taxonomy (1956) moving from lower order thinking skills to higher order thinking skills. This again provides a theoretical basis for the tool that is being created.

### B. Assessment Parameters of Rhythm Protocols

This tool measures the skills in cognitive and emotional domains. In the cognitive domain, the items require skills related to organization of sound input, information processing skills, and short-term memory to reproduce the rhythm patterns. Rhythm reproduction skills assess

ability to recognize the temporal sequencing of sounds, group them into patterns for short-term memory, and then reproduce them.

In terms of emotional domain, the rhythm reproduction task will assess the ability to stay attentive, be able to match the pace of the rhythm and its tempo, and comply with the directions given for musical task. Rhythm reproduction task can assess one's ability to ground energy level for performing the task. These skills can be assessed by examining the following parameters:

i. Accuracy: Measures the amount of beats reproduced with accurate time distances among the beats. The cognitive process involved here is the ability to retain the exact temporal distance among the beats.

ii. Pacing: Measures the general tempo of the rhythm reproduction. The cognitive process involved here is the temporal perception of overall time frame of sound patterns. At the emotional level, the reproduced pattern manifests one's energy drive in the sound production. Being able to maintain the suggested tempo expected.

iii. Grouping: Measures the skills to organize rhythmic units and to reproduce by verifying the similarities and variations of the pattern among the beats. The cognitive process involved here is the ability to organize the sound information into meaningful segments.

iv. Task Completion: Measures the skills to accomplish the given direction. The cognitive process involved here is the ability to retain initial start and ending of the sound information.

v. Volume Control: Measures the skills involved in reproducing the rhythm at the intensity level presented. At the cognitive level, one's ability to perceive the sound intensity is observed. At the emotional-behavioral level, one's energy level and ability for impulse control is observed.

## 2. Procedure 2: Complexity Verification of Pilot Rhythm Items


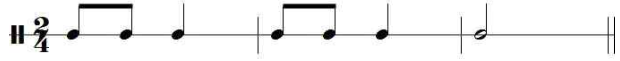



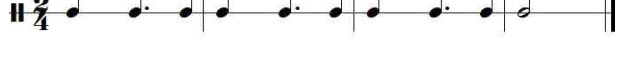

A total of 61 university students participated in the pilot study aiming to verify the complexity of test items in the MACEB-Rhythm complexity verification of developed rhythm



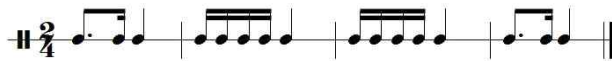

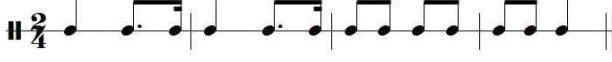
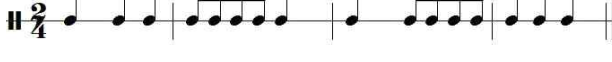

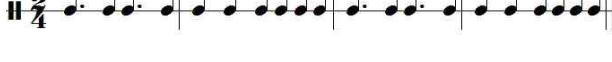


protocols. A total of 15 items were selected to test the complexity/difficulty level. The participants were tested individually using a keyboard connected to MIDI software. They were asked to listen to the rhythm pattern carefully and play back by tapping any key on the keyboard (Table 1).

Data were recorded and analyzed for each of their responses. Each of 15 test items were scored in terms of accuracy and grouping. One point was assigned to each beat, so a total possible score of each test item ranged from 6 to 8. Descriptive data provided item mean ( $M$ ), standard error ( $SE$ ), and item difficulty ( $P$ ). Item difficulty is defined as the proportion of subjects who answered the item correctly. For polytomously scored items, item difficulty indices are calculated by the mean of tester's scores on a item divided by the perfect score of the item. Depending on the analyzed data on the accuracy of the rhythm task, the items were rearranged and revised. Additional items were inserted where there was a complexity jump or gap among the items. The sequences were readjusted based on the item difficulty.

〈Table 1〉 Item Difficulty of Rhythm Test-Items (T-Items)

	Pilot item No.	$M$	$SE$	$P$
T-Item 1		4.67	1.03	0.93
T-Item 2		4.69	1.09	0.94
T-Item 3		4.97	1.26	0.99
T-Item 4		4.11	1.27	0.82
T-Item 5		3.20	1.50	0.64
T-Item 6		3.28	1.37	0.66
T-Item 7		5.11	2.31	0.73

〈Table 1〉 continue

	Pilot item No.	<i>M</i>	<i>SE</i>	<i>P</i>
T-Item 8		3.70	2.54	0.53
T-Item 9		3.85	2.02	0.48
T-Item 10		4.69	2.92	0.59
T-Item 11		3.36	1.67	0.42
T-Item 12		3.51	1.70	0.44
T-Item 13		3.10	1.31	0.39
T-Item 14		2.23	2.05	0.28
T-Item 15		1.92	1.38	0.24

Given the above data, items were revised and rearranged in order to provide comprehensive frame of progressing low to high complexity. Additional items were inserted in the beginning to expose and adjust to music task. Also, more challenging items were added to examine the threshold of the potential ability of increased complexity.

### 3. Procedure 3: Review Process for Rhythm Protocols for Music Therapy Assessment

Seven experts from the field of music education, music therapy and music psychology have reviewed the initial rhythm protocols 〈Table 2〉.

The reviewers were asked to evaluate the initially developed protocol regarding learning sequence, music cognition, and its feasibility for assessing skills in cognitive and emotional-behavioral domain.

〈Table 2〉 Reviewers' Expertise Areas for Item Evaluation




Field	No.	Expertise Areas
Music Education	3	Learning Sequence
Music Psychology	2	Music Cognition
Music Therapy	2	Assessment Skills
Total	7	

The reviewers were also asked to evaluate the items for the rhythm protocol and provide logical rationale for their comment on the item sheet. Based on their evaluation comment, the pilot rhythm items were revised and final rhythm protocol was formulated as shown in 〈Table 3〉.

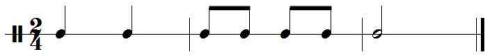





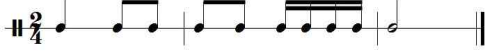


#### IV. Developed Rhythm Protocol for Assessment

The aim of this study was to develop music resource for assessment protocol starting with rhythm items, namely music therapy assessment for cognitive and emotional behaviors (MACEB-Rhythm). The initially developed rhythm protocols were formulated based on the theoretical foundations and application rationales researched in the existing literature. Through item complexity experiment and evaluation process of experts, a total of 20 items were finally developed. The rationale for each rhythm item for its sequencing is given as following 〈Table 3〉.

〈Table 3〉 Music Assessment for Cognitive and Emotional Behavior (MACEB) - Rhythm Protocol

Item No.	Items	Rationale
1		<ul style="list-style-type: none"> <li>- Repetition of beats (quarter note) in a steady pattern</li> <li>- Entraining of steady beats</li> </ul>
2		<ul style="list-style-type: none"> <li>- Repetition of beats (half note) with extended time span in a steady pattern</li> </ul>
3		<ul style="list-style-type: none"> <li>- Alteration of two beats: quarter and half notes</li> <li>- Compare and contrast long and short notes</li> </ul>

〈Table 3〉 continue

Item No.	Items	Rationale
4		<ul style="list-style-type: none"> <li>- Presentation of beats (quarter note) and its subdivision (2nd level: 8th note)</li> <li>- Beats and its subdivision, respective repetition</li> </ul>
5		<ul style="list-style-type: none"> <li>- Subdivided pattern and repetition</li> <li>- Clear gestalt and grouping of quarter note and the subdivision (2nd level)</li> </ul>
6		<ul style="list-style-type: none"> <li>- Reverse subdivision and its repetition</li> <li>- Clear gestalt and grouping of subdivision and quarter note</li> </ul>
7		<ul style="list-style-type: none"> <li>- Subdivisions (3rd level) and its repetition</li> <li>- Clear gestalt and grouping of quarter note and the subdivisions</li> </ul>
8		<ul style="list-style-type: none"> <li>- Reverse subdivision and its repetition</li> <li>- Clear gestalt and grouping of subdivisions</li> </ul>
9		<ul style="list-style-type: none"> <li>- Pattern with a quarter note and dotted note.</li> <li>- Clear gestalt and grouping of the measure repeated</li> </ul>
10		<ul style="list-style-type: none"> <li>- Presentation of all three levels of beats: quarter note with the two levels of subdivisions</li> <li>- Sequential subdivision without repetition</li> </ul>
11		<ul style="list-style-type: none"> <li>- Patterns with subdivision without sequence: quarter note with the two levels of subdivisions</li> <li>- Patterns with 2nd and 3rd level subdivision presented in a mirroring structure</li> </ul>
12		<ul style="list-style-type: none"> <li>- Mixture of dotted rhythm and the 3rd level subdivision</li> <li>- Retrieval of first measure rhythm pattern</li> </ul>

<Table 3> continue

Item No.	Items	Rationale
13		<ul style="list-style-type: none"> <li>- Combined rhythmic patterns with repetition</li> <li>- Two clear groupings: First two measures and the last two measures respectively</li> </ul>
14		<ul style="list-style-type: none"> <li>- Reverse order of dotted rhythm with subdivisions (3rd level) in a mirroring structure</li> <li>- Retrieval of first measure rhythm pattern</li> </ul>
15		<ul style="list-style-type: none"> <li>- Lengthened rhythm pattern with dotted and subdivisions (2nd, 3rd level)</li> <li>- First measure repetition followed by variation with subdivisions</li> </ul>
16		<ul style="list-style-type: none"> <li>- Four different rhythmic patterns Subdivisions (3rd level) in the 2nd measure and the 3rd measure</li> <li>- Expanded attention span and activation of working memory</li> </ul>
17		<ul style="list-style-type: none"> <li>- Compilation of three different rhythm patterns</li> <li>- Clear grouping of two measures and exact repetition</li> <li>- Expanded memory span and activation of working memory</li> </ul>
18		<ul style="list-style-type: none"> <li>- Compilation of three rhythm patterns without any repetition</li> <li>- Variations without any repetition or prediction</li> <li>- Expanded memory span and activation</li> </ul>
19		<ul style="list-style-type: none"> <li>- Four different rhythmic patterns lacking repeated gestalt</li> <li>- Syncopated pattern with complex variation</li> <li>- Expanded memory span and overloaded information processing</li> </ul>
20		<ul style="list-style-type: none"> <li>- Inconsistent temporal distance with mixed rhythm patterns</li> <li>- Unexpected irregularity and lack of gestalt</li> <li>- Expanded memory span and overloaded information processing</li> </ul>

## V. Summary and Conclusion

Music therapy being multi-dimensional approach, there have been many challenging issues in developing effective assessment tools. Due to unique characteristics in the music therapy assessment tools and their utilizing process, it bears obstacles for the standardization. Also because music therapy involves multi-dimensional aspect of changes, assessing specific skills pertaining to certain area of functioning has difficulty to be clearly identified. However, despite of the challenges, it is warranted to develop music therapy assessment tools which can objectively measure and present assessment data providing essential direction in the therapy process.

Considering the premise that musical behavior is underlined by human behavioral function, it is crucial to develop music assessment that clearly links human musical behavior with functional skills. However, the existing assessment tools mainly focus on the developmental skills excluding efficient music-centered assessment protocols.

As Wigram, Pedersen & Bonde (2002) suggest that battery of tests and criteria for evaluation should be developed as a reliable tool. In this study, the item pool was developed followed by preliminary item analysis. Based on the findings and the panel review, items were rearranged, modified, or replaced, so yielding a 20-item, revised version of the MACEB-Rhythm. The developed rhythm protocol needs to be further experimented with non-clinical population to draw normal data on cognitive skills and emotional traits as the frame of reference. Further study should be followed using the developed rhythm protocols for its measurement criteria and assessment reliability and validity for the skills in cognitive and emotional-behavioral domain.

## References

- Adler, R. (2001). Music assessment of gerontologic needs and treatment: The magnet survey. St. Louis: MO: MMB Music, Inc.
- Bitcon, C. H. (1976). *Alike and different: The clinical and educational use of Orff-Schulwerk*. Santana: CA: Rosha Press.
- Bloom, B., & Krathwohl, D. (1956). *Taxonomy of educational objectives: The classification of educational goals, Handbook I: Cognitive domain*. New York: David McKay.
- Bigand, E., McAdams, S., & Foret, S. (2000). Divided attention in music. *International Journal of Psychology, 35*(6), 270-278.
- Boxil, E. H. (1985). Music therapy for developmentally disabled. Rockville, MD: Aspen Systems.
- Bregman, A. S. (1994). *Auditory organization in music*. In A. S. Bregman, *Auditory scene analysis: The perceptual organization of sound (2nd ed.)*. (pp. 455-528). Cambridge, MA: MIT Press.
- Bruscia, K. E. (1987). *Improvisational Models of Music Therapy*. Springfield, III: Charles C. Thomas Publications.
- Chase, K. M. (2004). Music therapy assessment for children with developmental disabilities: A survey study. *Journal of Music Therapy, 41*(1), 28-54.
- Cassity, M. D., & Cassity, J. E. (2006). *Multimodal psychiatry music therapy for adults, adolescents, and children: A clinical manual*. Saint Louis: MO. MMB Music Inc.
- Chong, H. J. (2004). *Music therapy: Understanding and application*. Seoul: Korea. Ewha Womans University Press.
- Chong, H. J. (2010). *Human behavior and music*. Seoul: Hakjisa.
- Coon, D. (1997). *Essentials of psychology: Exploration and application*. New York: Brooks/Cole Publishing.
- Cowan, N. (2001). The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *Behavioral and Brain Sciences, 24*(1), 87-114.
- Cripe F. F. (1986). Rock music as therapy for children with attention deficit disorder. An exploratory study. *Journal of Music Therapy, 23*, 30-37.
- Deliege, I., & Sloboda, J. (1996). *Musical beginnings: Origins and development of musical competence*. Oxford University Press.
- Derri, V., Tsapakidou, A., Zachopoulou, E., & Gini, V. (2001). Complexity of rhythmic

- ability as measure in preschool children. *Perceptual and Motor Skills*, 92(3), 777-785.
- Di Franco, G. (1999). Music and autism: Vocal improvisation as containment of stereotypes. In T. Wigram and J. De Backer (Eds.), *Music therapy in health and education*. London: Jessica Kingsley Publishers.
- Drake, C. (1998). Psychological processes involved in the temporal organization of complex auditory sequences: Universal and acquired processes. *Music Perception*, 16(1), 11-26.
- Drake, C., & Palmer, C. (2000). Skill acquisition in music performance: Relations between planning and temporal control. *Cognition*, 74(1), 1-32.
- Gordon, E. E. (1970). *Iowa tests of music literacy*. Cedar Rapids, IA: University of Iowa Press.
- Gordon, E. E. (1980). *Learning sequences in music skill, content and patterns*. Chicago: G.I.A. Publications.
- Handel, S. (1993). The effect of tempo and tone duration on rhythm discrimination. *Perception & Psychophysics*, 54(3), 370-382.
- Hanser, S. (2000). *New music therapist's handbook*. Boston: Berkely Press.
- Hintz, M. R. (2000). Geriatric music therapy clinical assessment: Assessment of music skills. *Music Therapy Perspectives*, 18(1), 31-40.
- Lerdahl, F. A., Jackendoff, R. A., & Jackendoff, R. S. (1983). *A generative theory of tonal music*. The MIT Press.
- Loewy, J. (2000). Music psychotherapy assessment. *Music Therapy Perspectives*, 18(1), 47-58.
- Montello, L., & Coons, E. E. (1999). Effects of active versus passive group music therapy on preadolescent with emotional, learning and behavioral disorders. *Journal of Music Therapy*, 35(1), 49-67.
- Nordoff, P., & Robbins, C. (1977). *Creative music therapy*. The John Day Company, New York, NY, USA.
- Pavlicevic, M. (1995). Interpersonal processes in clinical improvisation: Towards a subjectively objective systematic definition. In T. Wigram, B. Saperston and R. Wets (Eds.), *The art and science of music therapy: A handbook*. London: Harwood Academic Publishers.
- Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1993). Music and spatial task performance. *Nature*, 365(6447), 611.
- Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1995). Listening to Mozart enhances spatial-temporal reasoning: Towards a neurophysiological basis. *Neuroscience Letters*, 185(1), 44-47.



- Rauscher, F. H., Shaw, G. L., Levine, L. J., Wright, E. L., Dennis, W. R., & Newcomb, R. L. (1997). Music training causes long-term enhancement of preschool children's spatial-temporal reasoning. *Neurological Research, 19*(1), 2-8.
- Rickson, D. J., & Watkins, W. G. (2003). Music therapy to promote prosocial behaviors in aggressive adolescent boys-a pilot study. *Journal of Music Therapy, 40*(4), 283-301.
- Rider, M. (1981). The assessment of cognitive function level through musical perception. *Journal of Music Therapy, 18*(3), 110-119.
- Swartz, K. P., Hantz, E. C., Crummer, G. C., Walton, J. P., & Frisina, R. D. (1989). Does the melody linger on? Music cognition in Alzheimer's Disease. *Seminars in Neurology, 9*(2), 152-158.
- Sloboda, J. A. (1985). *The musical mind: The cognitive psychology of music*. Oxford University Press.
- Snyder, J. S., & Alain, C. (2007). Toward a neurophysiological theory of auditory stream segregation. *Psychological Bulletin, 133*(5), 780-799.
- Wells, N. F. (1988). An individual music therapy assessment procedure for emotionally disturbed young adolescents. *Arts in Psychotherapy, 15*(1), 47-54.
- Wigram, T., Pedersen, I. N., & Bonde, L. O. (2002). *A comprehensive guide to music therapy: Theory, clinical practice, research, and training*. Jessica Kingsley Publishers.

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