The perception of dancers on the congruence between music and movement in a rhythmic gymnastics routine

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Abstract: The issue of using music synchronously or asynchronously in the field of dance has long been discussed by scholars and practitioners. In sports which involve a routine, it has been observed that some athletes use music merely as a background effect while others opt to choreograph routines in close congruence with musical details. This paper aims to investigate the perception of respondents who have a background in dancing of the congruence between movements and music in a rhythmic gymnastics routine. The study also intended to investigate the quality of the enhanced music accompaniment in the selected sports routine. A routine performed by a gymnast was recorded and new music, closely synchronized with every movement of the gymnast, was composed based on the existing choreography. Fifty-six ballerinas were presented with two videos. Both videos show the same routine, but one has the original music used by the gymnast and the other, the new music. Through a survey, the respondents were asked to choose which video presented the performance in which music and the routine are more congruent. The result shows that the routine accompanied by new music was mostly chosen by the respondents. Of the many elements, tempo and climax in the new music were considered to be the most significant in the congruence between music and routine.

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1. Introduction

This article looks into some issues of the music accompaniment used in sports activities that involve a routine or choreography such as synchronized swimming, rhythmic gymnastics, figure skating, or martial arts. Amongst many sports, rhythmic gymnastics can be considered as one of the sport activities most involved with music due to its origins and association with the Swiss composer and music educator Emil Jacques-Dalcroze, who introduced eurhythmics, relating rhythm and body movements. He believed both entities are the basis of music pedagogy and expressivity (Seitz, J. 2005). Since the use of music is inevitable in performance or in competitive events for rhythmic gymnastics, many interesting issues can be raised from several different perspectives. Among research on sports and music, the use of music in this type of sport is closely related to 'synchronous' music (Karageorghis et al., 2010), in which music and movements of the routine should 'match'. However, it is important to note that while both music and choreography can be quite subjective in terms of style and creativity amongst coaches and athletes, the perception, preferences, and experience of spectators should not be neglected. From many fields of study, the involvement of the audio experience causes certain effects in the visual experience or perception. This paper comes from a study which looks at the perception of respondents with different backgrounds, i.e. musicians, dancers, and those who have no background in either subject. However, this paper reports on the congruence between music and movement in a particular rhythmic gymnastics routine only in the perception of dancers. The purpose is to analyse if much congruence between music and movement can be perceived by the audience in a performance video, and if congruence provides a better visual experience of the performance. Another purpose is to identify whether approach of composing a new music accompaniment to an existing choreography can enhance the overall routine.

Use of music in sports and dance

Research in different fields has looked into the many aspects of music function in sports or sports routines. Most of the sports research investigates ergonomic effects for sportsmen concerning the enhancement of stamina, motivation, energy and so forth (Karageorghis et al., 1999, Hayakawa et al., 2000, Matesic and Comartie, 2002, Elliot & Orme, 2005). Synchronous music is used as a type of metronome to regulate a movement pattern, while asynchronous music functions more as a background accompaniment 'without conscious synchronization between movement patterns and musical tempo' (Karageorghis et al., 2010). Athletes' music

preferences have also caught much of scholars' attention (Gfeller, 1988; Tenenbaum et al., 2004). Discussing figure skating, Harman et al. (2009:89) stated that 'The choice of music becomes one of the most important decisions in developing a programme. […] The choice of music must enhance the skater's personality, talent and technical ability'. Through surveys of videos and websites, it is evident that some music is overwhelmingly preferred for certain sports routines. For example, movie soundtracks from *The Matrix*, *Pirates of the Caribbean*, *Once Upon A Time In Mexico*; and Western classical music or opera such as Bizet's *Carmen*, Tchaikovsky's *Swan Lake*, Mussorgsky's *Pictures at an Exhibition* are common choices in rhythmic gymnastics. Nevertheless, popular music numbers with famous themes or motifs may indirectly be attractive to the audience.

Contrary to sports with repetitive movements such as running, cycling, aerobics and swimming, the use of music in sports with a routine can be closely related to dance, since it involves not merely the skills, technique, stamina, and acrobatic movement of the athlete, but also the creativity and aesthetic that contribute to the overall performance. The most significant investigation into the relationship between dance and music can be found in the research of Hodgins (1992), in which choreomusical analysis involving both movement and score was first introduced. In his findings, using different (although not necessary synchronously) music with a similar choreography affected the viewers' perception of the performance in terms of tempo, duration, structure and quality (smooth – sharp). These aspects are dictated to a certain extent by the music, even before the choreography was made (Hodgins, 1992:7). Criteria of the relationship between dance and music in the choreomusical analysis are categorized by Hodgins into intrinsic and extrinsic factors. The intrinsic relationship relates to the domain shared by both musical and kinesthetic gesture, which do not depend on the narrative or context of the dance, including the preconceptions of audience and the performer on shared cultural knowledge. The five subcategories include rhythmic, dynamic, textural, structural, qualitative and mimetic. The extrinsic relationships depend fundamentally on the cultural context and the narrative of the dance characters and plot, together with the pre-knowledge of the audience of sociological, psychological and mythological information. The three subcategories in the extrinsic relationship are archetypal, emotional/psychological and narrative (Hodgins, 1992). In the field of sports, this relates closely to the rhythmic response and musicality known as internal factors and the cultural impact and association referred to as external factors Karageorghis and Priest (2012). This is closely associated with sport routines which are often accompanied by selected or edited music, and the question arises as to what extent the music affects the visualization or spectatorship of a particular sport routine.

Regardless of dance or sports, the function and effects of music on these subjects that indirectly change viewers' perceptions raise many issues and invite more research from different fields. The issue of using music that 'matches' a choreography has long been discussed in the field of dance. Choreography that corresponds greatly to the music, such as that of Balanchine, is prominently known, but there have been those such as Cage and Cunningham who are opposed to dance being a slave to music (Miller, 2002). The same problem applies to sports routines, as it has been found that some routines are congruent with the selected music but others use music only as a background accompaniment. However, most of the rules and code of points in competitive events apparently suggest that a routine should match the selected music or musical style. For example, in the 2013 'Code of Points' for rhythmic gymnastics, penalties are incurred for 'isolated occurrences when the rhythm and/or character and the music are disconnected'; in FINA (Federation Internationale De Natation), music interpretation and use of music in choreography account for points in synchronized swimming (SS17 Judgment of routine); and in the Rules of International Wushu Tao Lu Competition, 2005, it is stated that 'the competitor may choose a piece of music on his own to match the choreography'

Despite providing a sonic experience for the spectators, judges and contestants, music also acts simply as a time keeper for a routine. Whether or not the music is employed as a background accompaniment or is synchronized with the movement of the athlete, the duration of the music will provide guidance to the contestants; the standard duration for each contestant also indirectly monitors the overall schedule of the event. For example, the use of music in Tai Chi eliminates or replaces the previous practice of using a judge's whistle as a reminder when a contestant approaches the maximum time allowed. To a certain extent, the whistle disturbed not only the athlete's concentration but also the audience. In addition, music contributes as a track throughout the routine where an athlete can control exactly the duration and the tempo of each movement according to different sections of the music.

Perception of congruence between music and movement

The meaning of 'match' between music and choreography or dance could be subjective in the field of dance, music or any subject related to the arts. Apart from musical aspects such as phrasing,

articulation, dynamic, structure, and many other factors, the audience's experience in listening, their preferences, cultural background and the difference in generations may also affect their perception in viewing a performance. Mitchell and Gallaher's research (2001) shows that congruence is perceived between music and movement even when both subjects are temporally separated. The idea of congruence also emerges from the research of Krumhansl and Schenk (1997) in which it was found that respondents are aware of the correspondence between music and dance, based on a perceptual experiment using Balanchine's choreography of Mozart's Divertimento.

However, since the nature and function of sports routines are different from dance, as they display a more physical than aesthetic quality, other visual perceptions from different contexts are worthy of discussion. Looking at the various acrobatic movements from sports routines, this current study can also consider the visual perception of 'capture' effects derived from McGurk or McDonald (1976) in which a visual stimulus is perceived differently when combined with an auditory stimulus. Through this principle, the ability of music or sound to enhance certain acrobatic movements, for example a jump, turn, or the momentum of certain movement, can be investigated. In the field of film music, visual material could also influence people to perceive congruence in an auditory material where music and dance was similarly perceived as significantly congruent even when not intended to be so (Mitchell and Gallaher 2001). This was interpreted as 'visual capture'. Bolivar et al. (1994) gave an example in which people interpreted simultaneously a 'friendly' music in congruence with an aggressive interaction from a videotape. Given the many different contexts, theories and discussion from various fields, this study aims to support the principle of congruence between music and movement that could provide a better visual perception. Other studies that involve the issue of congruence between the music and sports routine were also explored which includes the importance of musicality in gymnasts (Loo & Loo 2012a) perception of phrasing (Loo & Loo 2013a) and the application of Tai Chi principle such as breathing and relaxation in piano pedagogy (Loo & Loo 2012b; Loo & Loo 2013b).

2. Material and Methods

A rhythmic gymnastics performance using ribbon apparatus at the gymnasium of a school was chosen for this study. The athlete in this performance has more than 10 years' training in rhythmic gymnastics and has participated in numerous competitions. The performance was recorded approximately a month before a competition so the athlete had mastered the routine well. It was observed that the practice during the observation focused on aiming at perfection in acrobatic movements, including spiralling, throwing and catching the apparatus. Altogether five recordings of the same routine were made and the best performance was selected. These performances were recorded using a Canon FS100 mini DV camcorder. In producing new music for this routine, the recorded video was muted and a newly-composed accompaniment was superimposed on it. The compositional process was done with Logic Pro8. Details of the new music aimed to match the movements of the routine, particularly on phrasings, jumps, and turns, and to highlights special elements such as throwing or catching the ribbon. To avoid a preference in musical style, the new music accompaniment was written in Western classical style, similar to the original music. Two videos of the same routine were prepared for the survey, one with the original music used by the athlete and the other with the new music accompaniment.

A short questionnaire of twenty questions was prepared and designed to be as general as possible, asking the respondents to choose which video presents a better congruence between the music and movement, such as phrasing, expression, direction, momentum and climax. The purpose of this survey was explained to the respondents and the videos presented one at a time. After that, the respondents answered the questions in the survey. There were 56 respondents altogether in this study, all of whom had trained in ballet for more than five years. These respondents were aged between 18 and 25 and are still actively involved in dancing. To avoid an irrational primacy effect in this study, twenty-eight respondents viewed the original video first followed by the second video with new music, and the other twenty-right did the opposite.

3. Results and discussion

The questions are categorized in three groups; the first concerns the congruence between the apparatus movement and music; the second focuses on the expression of the performance, and the third questions the general congruence between the two subjects, together with questions regarding the quality of the performance. From the replies, it can be revealed that the video with new music accompaniment (V2) was mainly chosen by the respondents as showing the better congruence between music and movement rather than the original video (V1).

In the first category, V2 recorded a high percentage of 73.2% for overall congruence between music and movement of the ribbon. Half the respondents (50%) chose V2 as demonstrating more directions for the acrobatic movement such as the

throw and catch of the ribbon, while 25% rated both videos as having the same quality and 25% chose V1. In terms of the momentum of the apparatus, 53.6% felt V2 displayed more momentum (Figure 1).

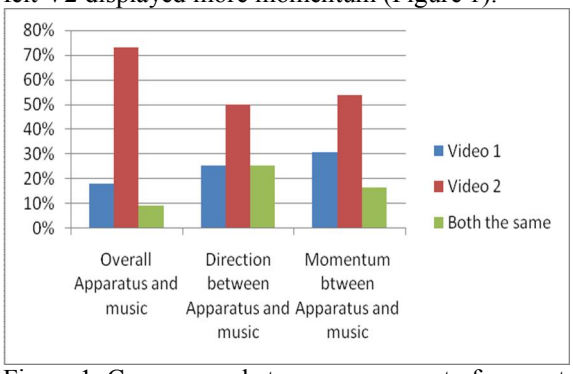

Figure 1. Congruence between movement of apparatus and music

In the second category, the study aimed to investigate the congruence between expressions of the gymnast's movement and the music. The highest percentage in this group was recorded for V2 (60.7%) which shows that the music has a better 'match' of the expression of the gymnast. Respondents were also asked whether the videos demonstrate that overall expression of the gymnast corresponds to the music. For this question, respondents could choose 'yes' or 'no' for either video; or 'yes' or 'no' for both videos. For V1, 44.6% of respondents felt that the overall expression of the gymnast corresponded to the music, compared to the slightly higher percentage of 60.7% for V2. The same type of question was also asked regarding correspondence between facial expression and the music. Again, a slightly higher percentage (57.1%) of viewers opted for V2 in comparison with 44.6% for V1 (Figure 2). However, 51.8% replied 'both are the same' when asked which video is more expressively performed, followed by V2 (39.3%) and V1 (8.9%). This question was asked to elicit a general opinion on the overall experience of both videos without giving emphasis to any particular aspect.

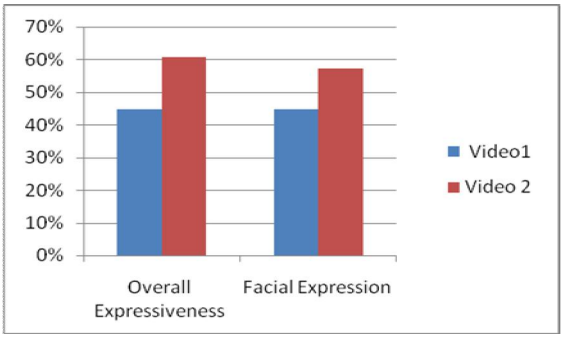

Figure 2. Congruence between expressiveness of movement and music

The third category focuses on the overall congruence in the routine to identify if the music enhances the performance visually in certain aspects. A total of 62.5% respondents chose V2 for the overall quality of congruence between the music and routine whereas 25% felt that both videos are the same. Another aspect is the congruence between the phrasing of the music and specific movements/elements, 51.8% chose V2 as showing a better match, and 37.5% perceived that both video have the same quality. Among the questions, the highest percentage appeared to be on the question of musical tempo. 75% of respondents felt V2 had the more suitable tempo. However, a majority of the viewers, 69.6%, identified that the overall speed of the movements in both video was the same. In terms of the overall music, 71.4% perceived the music in V2 as more appropriate for the routine. Notably, V2 with 67.9% was recorded as showing a more convincing climax; 66.1% thought that the performance in V2 was more attractive and 53.6% of the respondents felt V2 showed more momentum in terms of the gymnast's movement (Figure 3).

From the survey, only two questions did not give a positive vote for V2. This applies to one of the questions in the third category as to which music in the video shows more directions to the movement of the gymnast, where V1, V2 and 'both are the same' have an almost equal percentage (V1 with 32.1%, V2 with 33.9% and 'both are the same' with 33.9%). For another question on the overall expression of the performance, 51.8% of respondents perceived that both videos demonstrated the same quality of expression, although this was followed by V2 with 39.3%.

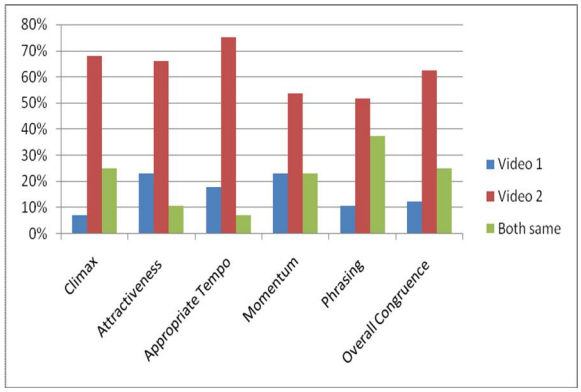

Figure 3 Congruence between the routine and music

From these results, it can be seen that the video with the new, changed music was generally chosen by the respondents who have a dancing background. This further underlines that congruence between the two domains can be identified; as stated

'parallels between music and dance may be found in tempo, dynamic, texture, contour and the structuring of larger-scale hierarchically organized formal units' (Krumhansl and Schenck 1997:64). Music and a dance, or choreographed work, are to a certain extent parallel. As Hodgins (1992) identified, the two categories of intrinsic and extrinsic involve characteristics which are shared by both music and dance. In addition, elements shared between music and movement were further elaborated upon by Mason (2012), which he termed 'structural equivalents' between music and the body in movement. Other than rhythm, phrasing, time and duration, Mason (2012:10) gave examples such as 'intensity of sound' in music that parallels ' muscular dynamics' in dance; 'pitch' in music related to 'position and direction of gestures in space' and so forth. Frego (1999) also explained that artistic tension can be identified by both perceivers of music and dance from certain elements in the two subjects.

The higher percentage recorded for the new music accompaniment for elements such as momentum, phrasing and climax prove that synchronization between the two should also be reinforced. Again, this also supports the principle of 'audio capture' where music can influence the visual perception of the same movement. The much improved momentum and climax may directly conform to a routine that is more exciting and thus gain more attention, as shown in the result.

Although the recording with new music accompaniment was a positive choice, the percentage was not as significant as that found in the subgroup of respondents with a musical background (Loo et al., 2013c). That was rather an expected outcome as musicians may be more aware of the musical details that were aimed to match the movements. By way of contrast, viewers who are trained in dance are more likely to focus on the body movements in the routine. This could explain why almost half of the respondents in this survey felt that the expression of both video had the same quality, although those who considered the new accompaniment video to be more expressive was not less, as reported above. In other words, the difference in music did not significantly affect the visual perception of the dancers regarding the expression of the performance. However, overall, the intended congruence in the new music accompaniment evidently affected the visual perception of the viewers.

4. Conclusion

The main aim of this study was to enhance the music accompaniment in a sports routine, particularly in terms of congruence between the two subjects. The experimental approach of using music in a sports routine was also one of the objectives in this research. It was found that the intended congruence between a music and routine was evidently perceived visually by respondents with a dancing background. Based on the survey, the preference for the new accompaniment reflects the possibility that music could be composed based on the existing choreography of a routine. This is contrary to the conventional method in which a routine is choreographed based on an existing music, which most often causes limitations for the choreographers. This research is based only on a video that was edited with two different musics. However, the study needs further experiments to look into the perception of viewers when an athlete uses a new especially composed accompaniment for the same routine in a live performance.

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