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Effect of Strength of Rhythmic Beat on Preferences of Young Music Listeners in Brazil, Greece, Japan, Portugal, and the United States

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Abstract

In a series of two experiments we tested music listening preference opinions of 1093 participants in Brazil, Greece, Japan, Portugal and the United States using a listening test composed of jazz, popular, and art music excerpts that represented stronger or weaker presentations of rhythmic beat. Listener ages ranged from 9 to 13 years, and sex was fairly evenly distributed in each country. Effect of beat strength was a highly significant influence on music listening preference, with music that had a stronger rhythmic beat receiving consistently higher preference ratings. There were significant interactions between beat strength and country, beat strength and sex, and country and sex. Among the main effects, beat strength accounted for 34% and country accounted for 2% of preference variation in this study. Interactions of beat strength and country, beat strength and sex, and country and sex accounted for 12%, 9%, and 2% of preference variation respectively.

Introduction

In a review of literature on the effects of musical characteristics on preference (Fung, 1995) and a series of studies (LeBlanc, 1979, 1981; LeBlanc & Cote 1983; LeBlanc & McCrary, 1983; LeBlanc & Sherrill, 1986; LeBlanc, Colman, McCrary, Sherrill & Malin, 1988; LeBlanc, Sims, Malin & Sherrill, 1992; LeBlanc, Sims, Siivola, & Obert, 1996; LeBlanc, Jin, Stamou & McCrary, 1999; LeBlanc, Jin, Stamou & McCrary, 1999, April; LeBlanc, Jin, Chen-Hafteck, Oliveira, Oosthuysen, & Tafuri, 2000/2001) designed to test and refine a theory of the acquisition of music listening preferences (LeBlanc, 1980, 1982), evidence has repeatedly emerged to suggest that certain characteristics of the music heard, as well as listener's age and sex, and more recently the listener's country, have some effect on that person's music listening preference. Across a 27-year period of observing children in the United States while their music preference opinions were being measured, the senior author has often noticed behavior that suggested children were paying attention to rhythmic beat and that they preferred music with a stronger rhythmic beat. The primary behaviors observed were smiling and rhythmic body movement while music with a strong beat was being heard.

Our primary goal in this study was to measure music preference opinions of young music listeners in five different countries listening to music stimuli with a stronger and a weaker rhythmic beat. Our secondary goal was to evaluate the influence of listener's age, sex, and country on preference for stronger and weaker beat. We use the term "music preference opinion" as defined in Price, 1986. "Rhythmic beat" is part of a variable in LeBlanc's theory of music preference acquisition under the term "physical properties of stimulus." "Age" and "sex" are variables in the LeBlanc theory under the terms "maturation" and "sex." "Country" does not appear in the theory as such, being subsumed under the theory's cultural environment variables of "peer group," "family," "educators and authority figures," and "incidental conditioning."

Our preference scale was developed and tested in a series of pilot studies in the United States. We began this process by recording a source tape of listening excerpts that we believed represented very strong and very weak presentations of rhythmic beat. Our concept of rhythmic beat was a broad one. In some cases, beat was a loud percussion and/or bass line, in others, beat was very rhythmic melody, and in others, it was the overall interaction of melody, harmony, and rhythm. We believe that our excerpts covered most ways that rhythmic beat has been presented in Western music.

Our next step was to gather evidence that our own perceptions of beat strength were shared by a representative group of trained musicians. To do this, we played our source tape of 32 excerpts for a class of 25 junior and senior-level music education majors at a public university in the U.S.A. Midwest, asking them to rate each example for beat strength on a five step pictorial continuum, anchored by images of a feather and a hammer. When we examined means, we found that this group agreed with us rather closely on beat strength of the examples, but we also noted a few excerpts that generated comparatively large standard deviations. We targeted these excerpts for further review. The college student group generated a coefficient alpha of .97 as a measure of agreement among judges.

We next took our 32-excerpt source tape to two classes of middle school students, ages 11 and 12, in the U.S.A. Midwest. While we wanted to know if these students agreed with us on the relative strength of beat, the more basic question was whether or not they would be able to consistently perceive differences in strength of beat. These 52 students rated each source tape excerpt on the same five step beat continuum, generating a coefficient alpha of .75. We were satisfied that they were able to perceive relative beat strength, and that they tended to agree with us on which excerpts had a stronger beat. We computed Pearson correlations between college students and middle school students voting on beat strength with a result of .78 ($p < .01$). At this point, we

deleted six comparatively ambiguous excerpts from the source tape and named the resulting scale "Beatpref."

In selecting music excerpts, we tried to control for variation due to composer and/or performer, generic style of music, tempo, and performing medium. In every case we succeeded in finding light and heavy beat excerpts with the same composer and/or performer, and in 85% of the cases we were able to find light and heavy beat sections within the same piece of music. With art music excerpts, we were able to achieve this counterbalance within the same section of a longer work, for example within the same movement of a symphony.

Beatpref was a 26 excerpt listening test with two subscales representing stronger and weaker rhythmic beat with mean metronome values of 120 and 114 beats per minute respectively. All music excerpts were instrumental and drawn from the styles of American jazz and popular music, and from the Western European style of art music. Running times for the tapes were 16m 3s and 13m 42s for versions with and without excerpt numbers spoken (in English).

Because of the diversity of language and culture among our participants, we used 5-way pictorial response sheets in this study, allowing participants to enter a preference value ranging from 1 to 5 for each music example heard. Pictorial response sheets had been significantly preferred by participants in a previous study (LeBlanc, Jin, Simpson & Stamou, 1998), and they had attained slightly higher reliabilities than Likert-type response sheets (.92 compared to .90 in first use with the same participants). A table identifying each excerpt used in the Beatpref scale as well as source recordings is available upon request to the senior author.

Experiment 1

Method

Our objective in Experiment 1 was to try out our listening test in a country with a different language and culture, assess its reliability, and explore the effect of beat strength on music listening preference. We tested 198 male and female participants in Brazil, whose ages ranged from 9 to 11 years.

Results

Performance of the Beatpref scale was satisfactory in Brazil, yielding a coefficient alpha reliability of .90 for the entire group. Reliability seemed to rise with increasing age, yielding alphas of .86 and .92 for ages 9 and 10 respectively. Our sample of 11-year olds was too small to be comparable to the other age groups, so we did not compute reliability for this group. Mean preference for the strong beat subscale was 3.68 ($sd = .74$); preference for weak beat was 3.33 ($sd = .87$). We adopted an alpha level of .05 for all significance testing in this study, and the difference between preference for strong and weak beat was highly significant $t(197) = 7.37, p < .001$. We concluded that our measurement instrument was satisfactory across different cultures and that there was good reason to believe that beat strength had an influence on music listening preference, with a stronger beat being preferred.

Experiment 2

Method

Our objective in Experiment 2 was to apply the Beatpref scale to a sample of young listeners in four countries having widely different geographic locations, languages, and cultures. Because of the reliability results obtained in Experiment 1, we chose to draw a balanced sample of slightly older participants, aged 11 and 12.

Although ages 9 and 13 were represented in this new sample, we excluded them from further analysis because their numbers were highly disproportionate to those of our participants of ages 11 and 12. We tested 201 participants of ages 11 and 12 from Greece, 251 from Japan, 144 from Portugal, and 190 from the United States. These 786 participants were fairly evenly distributed across ages and sexes within each country.

Results

We assessed internal consistency reliability of our preference scale by computing coefficient alpha. Within countries, we obtained alphas of .82 in Greece, .86 in Japan, .92 in Portugal, and .80 in the United States. For both male and female participants, alpha was .85. Reliability of the two subscales across all participants was .81 for weak beat, and .76 for strong beat.

We computed mean preference scores (with standard deviations in parentheses) for each level of beat strength across all participants, obtaining 3.45 (0.60) and 3.09 (0.69) for strong beat and weak beat respectively. Within each of the four countries, we examined preference for stronger or weaker beat by age (11 or 12) and sex, yielding a 4 by 4 table with 16 cells. In each of the 16 comparisons within categories of country, age, and sex, strong beat examples were preferred. The same thing was true with each of the 8 marginal totals derived from this table that permitted comparisons between countries, between ages, and between sexes within age. However, there were interesting variations within overall preference for strong beat. In Greece, Japan, and the United States, females preferred weak beat examples more than did males in every comparison within age group. In six out of eight possible comparisons, males preferred a strong beat more than did females; two exceptions took place in Greece and Portugal. In Japan, preference for strong beat was surprisingly small, with a mean of 3.36 (0.63) compared to 3.28 (0.62). For all practical purposes, there was no preference between the two levels of beat strength in Japan. Preference means for the subscales ranged from a low of 2.65 to a high of 3.67; standard deviations ranged from 0.43 to 0.75 except for one outlier of 0.93. Our table of means, standard deviations, and number of participants by age, country, and sex for strong and weak beat examples is available upon request to the senior author.

We used a mixed-design ANOVA to determine effects of, age, country, sex and beat strength on preference. Age, country, and sex served as between-subjects variables, and beat strength served as a within-subjects variable (see Table 1). Results showed significant main effects for beat strength ($p < .001$) and country ($p < .01$). No significant main effects were found for age and sex. However, there were significant interaction effects ($p < .001$) between beat strength and country, beat strength and sex, and country and sex (see Figure 1). No other interaction effect was significant ($p > .05$).

We applied the *eta*-squared statistic on all significant main and interaction effects to estimate effect sizes. Although only a moderate effect size was obtained for beat strength (.34), this was the biggest effect size among all concerned variables and interactions. Two interaction effects with beat strength had smaller effect sizes: beat strength and country (.12) and beat strength and sex (.09). Effect sizes for the interaction between country and sex (.02) and for the main effect of country (.02) were small.

Discussion

The effect of cultural environment variables, which we operationalized as "country" in this study, was confirmed. Because this is the fourth time that we have found a significant country variable in a preference study, it is possible that a variable named "country" or "culture" should be added to the LeBlanc preference model. This may be a more efficient way to represent the effect of cultural environment when studies are undertaken involving preference measurement in different countries, especially those with notably different cultures, or with strongly different cultural groups within a single

Table 1
ANOVA with Three Between (Age, Country, Sex)
and One Within (Beat Strength) Factors

Source	SS	df	MS	F	p	Effect Size*
Between-subjects						
Age (A)	0.96	1	0.96	1.52	NS	
Country (B)	9.63	3	3.21	5.08	<.01	.02
Sex (C)	1.38	1	1.38	2.19	NS	
A x B	4.33	3	1.44	2.28	NS	
A x C	0.08	1	0.08	0.13	NS	
B x C	11.32	3	3.77	5.97	<.001	.02
A x B x C	2.94	3	0.98	1.55	NS	
Error	486.88	770	0.63			
Within-subjects						
Beat Strength (D)	52.23	1	52.23	392.53	<.001	.34
A x D	0.36	1	0.36	2.67	NS	
B x D	14.21	3	4.74	35.60	<.001	.12
C x D	9.68	1	9.68	72.76	<.001	.09
A x B x D	.38	3	0.13	.95	NS	
A x C x D	.11	1	0.11	.79	NS	
B x C x D	1.00	3	0.33	2.50	NS	
A x B x C x D	.56	3	0.19	1.41	NS	
Error	102.46	770	0.13			

N = 786

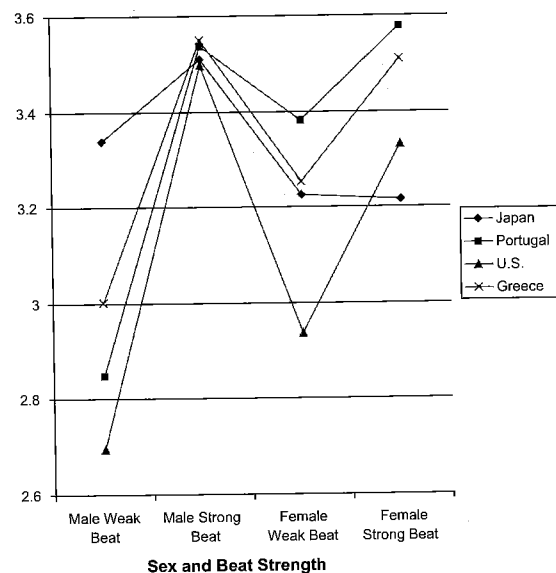
*Effect size based on *eta*-squared statistic.

Figure 1. Preference means by sex, beat strength, and country.

country. We recommend that additional music listening preference studies be conducted using cross-cultural participant samples.

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