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Effect of classical music on reducing blood pressure in children

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Abstract

Background High blood pressure remains a public health problem. High blood pressure in children and adolescent is a major risk for cardiovascular disease in adulthood which can cause high morbidity and mortality. Listening to the classical music can be used as an alternative in reducing high blood pressure.

Objective To investigate the effect of classical music in reducing blood pressure in children with high normal blood pressure and or hypertension.

Methods Eighty eight students of Sidorame Senior High School Medan with blood pressure ≥ 120/80 mmHg or blood pressure ≥ 90 percentile Task Force were included in this study. The Vivaldi's *Four Seasons* was played for 30 minutes using Sony stereo cassette recorder and earphone. The students' blood pressure were measured after listening to the music.

Results The reduction of students' blood pressure in the classical music group was greater than control group (ΔSBP, ΔDBP 9.41mmHg, 6.05mmHg versus 4.37mmHg, 2.23mmHg) and showed statistically difference.

Conclusion Listening to the classical music can reduce blood pressure in children with high blood pressure. **[Paediatr Indones 2008;48:142-6]**.

Keywords: *Classical music, blood pressure*

High blood pressure is a major risk factor for cardiovascular morbidity and mortality in adult. Many studies have documented that high blood pressure may begin in adolescence, even in childhood.[1,2] Children and young adolescents with blood pressure greater than the 90th percentile for age have threefold greater likelihood of hypertension in adulthood than children with blood pressure in the 50th percentile.[3] Fels Longitudinal study[4] found that children with systolic blood pressure >130 mmHg and / or diastolic blood pressure >85 mmHg have fourfold greater likelihood to have hypertension and fivefold greater to have metabolic syndrome in adulthood. It is reasonable to believe that early identification and effective management of high blood pressure in young individuals could conceivably further reduce the morbidity and mortality attributable to hypertension.

Music is a combination of rhythmical, harmonic and melodic sounds, and many people throughout history have believed in its medical effect.[5,6] There is renewed interest in the effects of music on health

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in the turning of a new century. Some studies have documented, music can reduce anxiety during invasive management,[7-10] music has therapeutic effects on children undergoing cardiac surgery,[11] and music can lower blood pressure.[12,13] Although its mechanism of action is still very controversial, music appears to reduce the liberation of catecholamines, hence reduce heart rate and blood pressure.[11]

The aim of this study was to investigate the effect of classical music in reducing blood pressure in children with high normal blood pressure and or hypertension.

Methods

A pre- and posttest control group design study was conducted at Sidorame Senior High School Medan, from May to July 2006. The inclusion criteria were students aged 15-17 years old with blood pressure (BP) equal to or greater than 120/80 mmHg, or blood pressure equal to or greater than 90th Task Force. Informed consent was obtained from the students. Students who were experiencing illness or did not attend class at the time of study were excluded. Normal blood pressure was defined as average systolic or diastolic blood pressure less than the 90th percentile for age and sex. High normal blood pressure was defined as average systolic or diastolic blood pressure equal to or greater than the 90th percentile but less than the 95th percentile or blood pressure equal to or greater than 120/80 mmHg. Hypertension was defined as average systolic or diastolic blood pressure equal to or greater than the 95th percentile for age and sex measured in at least three separate occasions.[1,14]

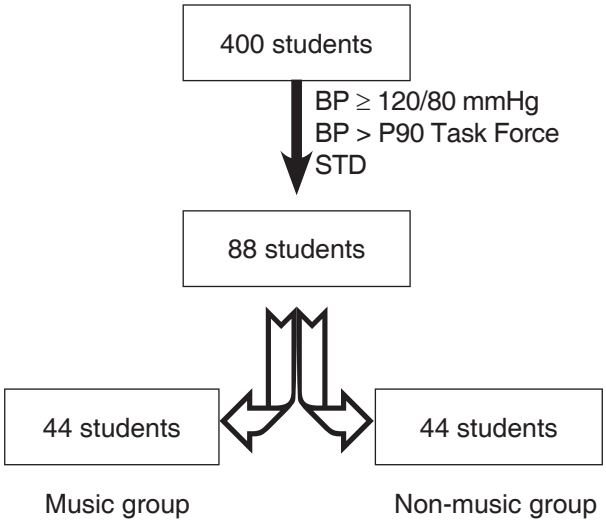

Figure 1. Trial profile

Students who were registered formally at Sidorame Senior High School Medan underwent general physical examination. Body weight and body length were measured by MIC@ stand up body weight that could measure up to 150 kg with the accuracy of 0.5 kg and body height scale that could measure up to 200 cm with the accuracy of 0.5 cm. Blood pressure measurements were taken in the morning between 8.30 am-12.00 noon by the same trained paramedics, using the standard protocol of the Task Force on Blood Pressure with mercury sphygmomanometer (Nova@). The equipment could measure up to 300 mmHg maximum with the accuracy of 2 mmHg. Subject was in a seated position following five minutes of quiet rest. Students with average blood pressure levels equal to or greater than 120/80 mmHg or students with average blood pressure equal to or greater than 90 percentile were randomly assigned to intervention group (Music) or control group (Non Music) by using computer program.

In a quiet and comfortable classroom in school, each student of music and non music group were given a music equipment consisted of stereo cassette recorder including cassette and earphone. Students of the control group were listening to blank cassette (no music) for 30 minutes, while students in the intervention group were listening to The Four Seasons by Vivaldi for 30 minutes with low to medium sound volume(60 to 70 beats per minute).[11] After that, the blood pressure of both groups were measured three times and the average value was considered as the blood pressure of the students. Data collected were processed using SPSS version 13.0 computer program.

Results

From 400 students at Sidorame Senior High School Medan, 88 students had blood pressure ≥ 120/80 mmHg and or blood pressureequal to or greater than 90th percentile Task Force Standard. Sixty students had normal-high blood pressure and 28 students had

hypertension. Forty - four students assigned to music group, while the other 44 were assigned to control group (non-music group). All subjects completed the study.

Table 1 shows that students in the music and non-music groups had similar baseline characteristics including age, gender, and body mass index. There were more female than male, but there were no difference in gender in both groups (P>0.05).

Table 2 shows mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) before intervention in music and non-music group. The mean of SBP and DBP in the music intervention group were greater than that of non-music group, but there were no difference in the mean of SBP and DBP before intervention between the two groups.

Table 1. Subjects characteristics

Characteristics	Music group n= 44	Non-music group n= 44
Age, mean (SD) yr	16.3 (0.66)	16.3 (0.69)
BMI, mean (SD) kg/m^2	21.8 (2.83)	22.8 (2.39)
Male, n (%)	16 (49%)	17 (51%)
Female, n (%)	28 (51%)	27 (49%)

SD = standard deviation, n= number of subjects

Table 2. Mean value of SBP, DBP before intervention in music and non-music group

Blood pressure	Music group n= 44	Non-music group n= 44
SBP, mean (SD), mmHg	124.3 (11.2)	121.1 (8.8)
DBP, mean (SD), mmHg	81.1 (5.3)	79.7 (4.6)

Table 3. Mean value of SBP, DBP after intervention in music and non-music group

Blood pressure	Music group n= 44	Non-music group n= 44
SBP, mean (SD), mmHg	114.9 (8.3)	116.8 (7.1)
DBP, mean (SD), mmHg	75.0 (5.4)	77.5 (5.1)

Table 3 shows the mean of SBP and DBP after intervention in music and non-music groups. The results showed that the students' mean SBP in both group were lower than that before intervention. The average of DBP in music and non-music group was also lower than that before. There was significant difference in DBP after intervention between the music group and non-music group.

In **Table 4**, we can see that the reduction of SBP and DBP in music group were significantly lower than that in non-music group after listening to classical music.

Discussion

Although high blood pressure is a clinical feature of many diseases, a spesific pathologic cause for in adolescent is rarely identified. Therefore, it is generally presumed that in majority of adolescents with elevated blood pressure is essensial hypertension.[14,15] In this study, students aged 15-17 years old with high blood pressure were chosen as subjects and no laboratory examination was performed to find a specific pathologic cause. Blood pressure was measured with a standard clinical sphygmomanometer and a stethoscope to confirm hypertension and the results were confirmed with the blood pressure table as The Task Force Report of Blood Pressure in Children and Adolescent (2004) recommendation. Chafin[16] evaluated the effect of music in reducing blood pressure in adolescent using an electric device to measured blood pressure.

The Four Seasons by Vivaldi was played for 30 minutes. The duration and the kind of music was similar with music that being played in previous studies.[11,16] The optimum duration for obtaining an effect is unknown, but several studies suggested

Table 4. Mean value of SBP, DBP before and after intervention in music and non music group

Blood pressure	Music n= 44			No music n= 44			
	Before M ; SD	After M ; SD	Δ	Before M ; SD	After M ; SD	Δ	P
SBP (mmHg)	124.3 (11.2)	114.9 (8.3)	9.4	121.1 (8.8)	116.8 (7.1)	4.3	<0.001
DBP (mmHg)	81.1 (5.3)	75.0 (5.4)	6.1	79.7 (4.6)	77.5 (5.1)	2.2	<0.001

M= mean, SD= standard deviation, Δ = the change of blood pressure

that a range of 25 to 90 minutes is sufficient.[16] Classical music was chosen because this type of music had therapeutic effect and it is believed that it can potentiate the increase intelligence and creativities.[5,17]

The used of blank cassette and the type of music in this study did not cause problems for students; no one refused or dropped out until the end of the study. This situation is different from that of Hatem's study[11], where children were excluded, because they refused to listen to blank CD as well as the type of the music. These children had already personal taste of music.

The results of this study showed that the reduction of blood pressure were significantly greater in music group than that in non-music group (ΔSBP, ΔDBP: 9.41mmHg, 6.05 mmHg vs 4.37 mmHg, 2.23 mmHg, respectively). There were also a decrease of task force standard's table percentile in both groups.The data indicated that sitting quietly and listening to the classical music was more beneficial in reducing blood pressure than only sitting in silence.Music's mechanism of action itself is still very controversial. Music ,which can cause slow and regular breathing, is known to affect reflex control of cardiovascular system and modulate blood pressure.[12,13] Some studies found that music relaxes the body, hence improves physiological outcomes such as heart rate, blood pressure, and reduces anxiety level.[8,9,18-20] Unfortunately investigating such physiological outcomes in details was not within the scope of this study and it is a limitation of this study. In addition, we found 85% subjects liked music, although this result was not analyzed but it seems other factors contributed to this study.

The generalization of this study is limited because all data were collected in only one Senior High School. Any conclusions and generalization reached may be applicable only in this particular population. The main limitation concerned whether the effect of Vivaldi's The four seasons can be generalized to all classical music. Further study with large number of sample, and long duration of study comparing all types of music, such as jazz, country music, even traditional music is needed. In conclusion, listening to the classical music can reduce blood pressure in children with high blood pressure.

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