The Influence of Progressive Muscle Relaxation Technique to Blood Pressure and Heart Rate on Hypertension Clients at the Adventist Hospital in Bandar Lampung, Indonesia

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Abstract: The prevalence of hypertension worldwide is increasing year-by-year and this is directly proportional to the negative impact (death). A progressive muscle relaxation (PMR) is a simple relaxation technique to control the hypertension. The purpose of this research is to analyze the influence of PMR on blood pressure (BP) and heart rate (HR) of the hypertension clients. Method: a quasi-experiment with pre and post-test of non-equivalent control group design. Samples of 45 respondents were selected through convenient sampling technique and divided into two groups, namely experiment (23) and control (22). In the experimental group was given PMR twice a day for four days. The results indicated that the rate of pre-BP (156.67/95.78 mmHg), post-BP (136.58/85.42 mmHg), pre-HR (91.16 times/minute), and post-HR (77.18 times/minute). In the experimental group (pre-post intervention), there were significant differences in the influence of PMR on BP and HR (p<0.05). In the control and experiment groups, there were significant differences in the influence of PMR on BP and HR (p<0.05). Conclusion: there is a significant influence of PMR to the BP and HR controls. An effective PMR technique needs to be developed by further researchers to be used as an independent-nursing intervention.

Keywords: progressive muscle relaxation, blood pressure, and heart rate

Introduction

Hypertension is often called a silent killer where the persons who get suffer do not aware because no have symptoms. The meaning of hypertension is the persistent elevation of systolic blood pressure over 140 mmHg and diastolic blood pressure greater than 90 mmHg (Hinkle & Cheever, 2014).

Research Background

According to the World Health Organization or WHO (2013), the prevalence of hypertension worldwide has increased year-by-year, which was increasing from 972 million to 1 billion people in 2000 and 2008, respectively. It is estimated that around 9.4 million people die annually due to complications of hypertension, i.e. 45% die of heart disease and 51% die of stroke. Health Research and Development Agency (2013) reported that Bandar Lampung is one of the provinces in Sumatra islands as the third largest number of hypertensive patients which is around 24.7% after Bangka Belitung 30.9% and South Sumatra 26.1%. Besides, based on data of medical record department from Bandar Lampung Adventist Hospital Indonesia, hypertension patients showed significantly increased from 515 clients to 1147 clients in 2014 and 2015, consecutively.

The incidence of hypertension is directly proportional to age, the data showed that about 50-60% of hypertensive patients aged above 60 years with blood pressure > 140/90 mmHg. This is associated with the condition of blood vessels that get thickening due to the accumulation of collagen substances in the muscle layer thus it reduces its elasticity (Shi, et al., 2009). On the other side, Anggraini, Waren, Situmorang, Asputra, and Siahaan (2009) stated that there was a statistically significant relationship between smoking habit and hypertension (p = 0.00). Cigarettes can affect the function of nitric oxide and cause endothelial dysfunction so that it becomes a risk of hypertension (Leone, 2011; Talukder, et al., 2011). Apart from that these risk factors are closely related to the lifestyle, therefore, it is very important to know the management in controlling hypertension.

Progressive muscle relaxation technique (PMR) is a simple relaxation technique, easy to do, no need to require a complex equipment and a wide site, and this is useful to lower blood pressure (BP) and heart rate (HR). Its work is through a focus concentration on a muscle activity, by contracting the muscle in some time and then decreasing muscle contraction to get relaxed (AHA,
The study of Shinde, Handee, and Bhushan (2013) mentioned that there were significant differences in pre and post measurement of systolic BP (p <0.01), diastolic BP (p = 0.05) and HR (p <0.05).

Based on the above evidence base, PMR is a non-pharmacological therapy which can be recommended to be a nursing intervention to hypertension clients especially to lower BP and HR. Hypertension is a chronic disease that is often recognized by the patient when his condition has deteriorated, this requires the sufferer to always try to adjust in order to survive.

Research Questions

According to the mentioned objectives, research questions are found on accommodation with the study for completion:

1. Are there any differences in the effects of PMR techniques on BP and HR on the experimental groups, before and after the intervention?
2. Are there any differences in the effects of PMR techniques on BP and HR in control and intervention groups?

Research purposes

The general purpose of this study is to analyze the effect of PMR technique on controlling blood pressure and heart rate in hypertensive clients at Adventist Hospital Bandar Lampung, Indonesia. Meanwhile the specific objectives in this study are:

1. To analyze the differences of PMR technique effect to BP and HR on experimental group, before and after intervention.
2. To analyze the differences of PMR technique effect on BP and HR in control and intervention groups.

Research methods

This research method is using quantitative quasi-experiment with pre and post-test design nonequivalent control group (Dharma, 2013). With this design, the effect of PMR on blood pressure and heart rate on hypertensive clients at Advent Hospital Bandar Lampung can be known.

Population and Sample

The target population of this study was Bandar Lampung Province where Adventist Hospital Bandar Lampung was located, while the affordable population in this study was the clients with hypertension who were hospitalized in Adventist Hospital Bandar Lampung, which was about 96 patients / month. The sample size was 45 respondents obtained by using non probability sampling method with convenience sampling approach.

Place and Time of Execution

The author chose Adventist Hospital Bandar Lampung, Indonesia as a research site because the hospital has a large number of hypertensive clients and the therapy used in the hospital is still focused on pharmacological and dietary therapies. In addition, self-care nursing interventions provided by the nurses in Adventist Hospital Bandar Lampung on hypertensive clients are oriented only on personal hygiene and activity of daily living.

Data Collection Process

Data collection process in this research is divided into three stages, namely administrative procedures and preparation of research data collection, research data collection procedures, and completion of research data collection procedures. In the intervention groups, the PMR technique was administered twice daily for four days. Meanwhile the control group was not given
intervention by the researcher, but received routine maintenance based on the procedures which were established by the hospital.

**Research Instruments**

The use of research instruments in this research are:

1. Sphygmomanometer and stethoscope to determine systolic and diastolic BP, and a watch to determine heart rate in pre-test and post-test in control and experimental groups. The author used sphygmomanometer of mercury at Adventist Hospital Bandar Lampung which has been calibrated by accredited calibration institute of National Accreditation Committee that is PT. MEDCALINDO.

2. Observation sheets used to record respondent characteristics and results of systolic, diastolic, and heart rate measurements on pre-test and post-test interventions in the control and experimental groups.

3. PMR technical procedures (Robinson, Segal, Segal, & Smith, 2015; Solehati & Kosasih, 2015; US Department of Veterans Affairs, 2015; Fairnie, Daniel, Arran, Booth, & Kirkby, 2014; Richmond, 2013; Shinde, Handee, & Bhushan, 2013; Hamarno, 2010):
   a. Hold your hand while making a fist, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   b. Straighten your arms and then bend your palms facing forward, holding them while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   c. Make a grip on both your hands and then fold it to the shoulder so that the bicep muscles become tense, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   d. Raise your shoulders to the maximum extent to almost touch both ears to strain the muscles in the shoulders, upper back and neck, holding them while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   e. Frown your forehead and your eyebrows until shows a tension in the muscles, holding them while feeling the muscle tension for five seconds, and then release the tension for 10 seconds.
   f. Close your eyes hard and pout your lips so tightly until shows a tension in the muscles of the eyes and mouth, holding them while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   g. Clenched the jaw and followed by biting the teeth causing tension in the muscles of the jaw, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   h. Pushing your head back to feel the tension in the back and upper back neck muscles, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   i. Direct your head forward and burrow your chin to your chest until you feel the tension in the neck muscles of the face, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   j. Arch your back forward and then bend your chest until you feel the tension in your lower back muscles, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   k. Take a deep breath and hold it for five seconds, while identifying or feeling the tension in the chest until the tension is felt in the chest muscles, and then releasing the tension for 10 seconds.
   l. Pulling the stomach in depth inside until it becomes hard and firm to the tension in the abdominal muscles, holding it while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
   m. Straighten both legs with the soles of the feet facing upwards until there is a tension in the thigh muscles, holding them while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.
n. Straighten both legs with the soles of the feet straight in the direction of the legs until the tension arises in the calf muscles, holding them while identifying or feeling the muscle tension for five seconds, and then releasing the tension for 10 seconds.

o. At each stage of the procedure progressive muscle relaxation therapy is performed twice and afterwards is given a rest period of 30 seconds before proceeding to the next stage.

4. Stationery and computer equipment used in operational and data processing researches.

Data analysis

The data analysis in this research is bivariate analysis using statistical test as follows:

1. Univariate analysis. The author conducted a univariate analysis using descriptive statistics to identify respondent characteristics based on systolic blood pressure, diastolic blood pressure, and heart rate (Susilo, Aima, and Suprapti, 2014; Dharma, 2013).

2. Bivariate analysis. The author conducted a bivariate analysis using the Wilcoxon test statistic test to achieve the first research objective, which was to analyze the effect difference on blood pressure and heart rate (pre-post intervention) from the experimental group on hypertension clients at Adventist Hospital Bandar Lampung. Then, Mann Whitney test to achieve the second research objective, which is analyzing the difference of influence on blood pressure and heart rate between experimental group and control group on hypertension clients at Adventist Hospital Bandar Lampung, Indonesia (Susilo, Aima, and Suprapti, 2014; Dharma, 2013).

Results and discussion

Analysis of the results of this study include univariate analysis and bivariate analysis to achieve research objectives, i.e. analyzing the effect of PMR techniques on controlling blood pressure and heart rate in hypertensive clients at Adventist Hospital Bandar Lampung.

Table 1.1 Results univariate analysis of respondent characteristics based on history, age, BP and HR

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre systolic</td>
<td>45</td>
<td>140</td>
<td>180</td>
<td>156.67</td>
<td>10.225</td>
</tr>
<tr>
<td>Post systolic</td>
<td>45</td>
<td>110</td>
<td>170</td>
<td>136.58</td>
<td>14.133</td>
</tr>
<tr>
<td>Pre diastolic</td>
<td>45</td>
<td>70</td>
<td>120</td>
<td>95.78</td>
<td>8.391</td>
</tr>
<tr>
<td>Post diastolic</td>
<td>45</td>
<td>60</td>
<td>100</td>
<td>85.42</td>
<td>11.050</td>
</tr>
<tr>
<td>Pre hr</td>
<td>45</td>
<td>72</td>
<td>120</td>
<td>91.16</td>
<td>9.468</td>
</tr>
<tr>
<td>Post hr</td>
<td>45</td>
<td>60</td>
<td>104</td>
<td>77.18</td>
<td>7.978</td>
</tr>
</tbody>
</table>

Source: Author’s calculation

Table 1.1 displays that the characteristics of respondents based on post systolic, diastolic, and HR values decreased when compared with pre systolic, diastolic and HR values. This means that the interventions given in this study (PMR) can affect the blood pressure and HR values. These findings are consistent with Alessio, Jeganath, Veronica, and Giuseppe (2014) studies which suggested that PMR has a significant effect on decreasing blood pressure and HR (p <0.05). Thus, PMR through stretching some specific muscle groups, then stopping or maintaining the contractions, and then releasing the tension or relaxing the muscle group slowly to disappear altogether can stimulate the muscular nervous system to regulate the blood pressure and HR become normal again (Varvogli and Darviri, 2011; McGuigan, and Lehrer, 2007).
Overall, the Wilcoxon bivariate test showed that there are significant differences in the effect of PMR technique on blood pressure and HR from the experimental group, before and after the intervention (p=0.000). Likewise with Mann Withney test analysis, there are significant differences in the effect of PMR technique on blood pressure and HR in control and experimental groups (p=0.000). The existence of this effect difference represents a significant contribution of PMR intervention in controlling blood pressure and HR on hypertensive patients. In addition, almost all respondents in the experimental group said that the body feels lighter, body aches are reduced, tension in the back of the neck, feeling sleepy and want to sleep, and feel more calm or comfortable after doing PMR techniques.

The PMR technique stimulates the autonomic nerves that act as a regulator in the vascular to decrease peripheral resistance and increase the elasticity of the blood vessels. In addition, PMR makes blood circulation more smoothly and facilitate oxygen transport, thus triggering the occurrence of peripheral blood vessel vasodilation. In other autonomic nervous mechanisms, PMR affects neurogenic control by stimulating baroreceptor to inhibit impulses to the central vasomotor sympathetic nervous system in the brainstem, thus reducing the frequency of heart rate and reducing the strength of heart contraction (Black and Hawks, 2014; Varvogli and Darviri, 2011; McGuigan, And Lehrer, 2007). So, with this mechanism PMR can help the body in regulating blood pressure and heart rate.

**Conclusion and suggestion**

In conclusion, there is a significant influence from PMR technique to blood pressure and heart rate. On the other hand, the suggestion on this research is the result of this research is nursing evidence base which can be socialized and applied in nursing service in giving self-nursing intervention on nursing care clients with hypertension, used by nursing students in addition to treasury self-nursing intervention in blood pressure control and heart rate on the client with hypertension. And to increase the evidence base, it is necessary to do next research involving other confounding variables (family history, gender, ethnicity, DM, stress, obesity, and nutrition) with larger samples and using true experimental method.

**References**


