# Muscle training intervention in heart failure article review

Principles of Research in Nursing Practice

A Critical Appraisal of Padula, C. A., Yeaw, E. and Mistry, S. (2009) A home-based nurse-coached inspiratory muscle training intervention in heart failure. Applied Nursing Research, 22: 18-25.

Guidelines by Burns and Grove (2011) form the basis of this appraisal.

Statement of the problem & purpose of the study

Padula et al. (2009) begin by discussing the clinical problem that led to the research being conducted. Disabling dyspnoea in heart failure (HF) is affecting patients' quality of life. Impaired inspiratory muscle function has been recognised as a potential source of dyspnoea in HF. The purpose of the research emerges logically from the clinical problem which is to determine the effectiveness of an inspiratory muscle training intervention (IMT) on dyspnoea and health-related quality of life (HRQOL). The purpose of the study is directly linked to the clinical problem because the experimental hypothesis; if upheld may facilitate improved therapies for HF patients.

Literature Review

This section is clearly defined and well organised. A review of the abstracts for the eight sources cited in the *' IMT in HF'* section denotes that all are relevant primary data-based studies. There are only two sources cited within 5 years of the acceptance date for publication. Sources should be current (Burns & Grove, 2011). The researchers fail to acknowledge whether a systematic search strategy was exercised (Moule & Goodman, 2009).

Furthermore, the investigators may have found additional sources if they had included theoretical literature.

Padula et al. (2009) paraphrase the knowledge gleaned from each source and form a critique of the overall methodology used in these studies. Three of the studies did not employ a control group; this decision may have threatened their capacity to infer causal relationships. In the RCTs, sample sizes were small and effect sizes were not published. Consequently, the ability to detect differences in outcomes between groups was compromised (Seers & Critelton, 2001).

The literature review identifies gaps in the knowledge base which builds a case for the present study. Padula et al. (2009) report that further research is necessary to determine the precise intensity of IMT.

Study Design & Sample

There is ambiguity regarding the study design as the researchers refer to the study as an RCT on two occasions. On closer inspection, the study does not meet the criteria for this classification as complete experimental control is not possible (CASP, 2014). The study is a two-group quasi-experiment with pre- and post-test design (Hek & Moule, 2006). This design is appropriate to address the research question.

Although participants are assigned to groups with equal probability, the method selected (i. e. coin toss) is not entirely appropriate for small sample sizes (i. e. n= 31) because it may lead to imbalance between the size of the experimental group and control group. Schulz & Grimes (2002) explain that

when a succession of tails or heads is thrown, it is tempting for the researchers to modify the results. This may result in subtle differences between groups. A more sophisticated method would be to use computer generated random numbers (Crombie, 2005). RCTs are conducted in research units to ensure greater control over extraneous variability. The present study was conducted in patients' homes.

The research population was stable HF patients without coexisting pulmonary disease or cognitive impairment. The sampling method is nonprobability convenience because the researchers recruited participants by means of newspaper advertisements and physicians' offices (Clark-Carter, 2001). This method may have excluded patients who did not visit their physician on a regular basis. The article fails to include a power analysis; a test to assess the study's ability to detect significant differences. The researchers acknowledge that the sample was small (n= 31). An effect size for IM strength was reported (d= 0. 48).

Data Collection

The data collection methods are appropriate for measuring the dependent variables (Padula et al. 2009). Test-retest reliability values are documented for the following measures: PI max, the Borg scale (1982), and self-efficacy. These values should be documented for *all* data collection methods (Burns & Grove, 2011). This useful statistical test is a measure of the stability of the scores elicited over time (Sim & Wright, 2000). A Chronbach's alpha score was only documented for one of the measures. This statistical test measures

internal consistency; i. e. how confident are we that the individual items in a scale are accurately measuring the same construct (Clark-Carter, 2001).

The article reports that the research assistants followed a specified protocol, however this is not provided in the report. The article should document all the steps taken to reduce errors during the data collection process (Burns & Grove, 2011). For example, it is unknown whether steps were taken to reduce user error in taking physiological measurements such as respiratory pattern.

Measurements were taken at spaced intervals (i. e. weeks 1, 3, 6, 9 & 12); this design feature strengthens our confidence in the findings. Mention should be made here of the possibility of demand effects; the notion that participants may have modified their responses on the Borg scale to match the expectations of the study (McCambridge et al. 2012).

Analysis

The inferential analyses (ANOVA) conducted are appropriate for the type of data collected (Ratio/interval and ordinal; Dancey & Reidy, 2011). Post hoc analyses were used to detect the location of the differences in two of the dependent variables; a best practice approach. A table showing all mean scores including significance levels for each dependent variable would be beneficial to the reader.

A significant difference was detected for IMT strength in the experimental group ($p < 0.0001$). As the p value is below the standard level of significance ($p < 0.05$), there is a negligible risk of incorrectly rejecting the null

hypothesis (Type 1 error; Burns & Grove, 2011). Similarly, significant differences were detected for Borg scores (dyspnoea; p <0. 0001) and between scores on the CRQD scale between the control and IMT group (p <0. 027). No significant differences were reported for HRQOL and self-efficacy.

Discussion

The key findings are clearly stated and are consistent with previous literature. The researchers offer an alternative explanation to account for why a significant improvement in IM strength and dyspnoea in the IMT group was found. Participants may have become accustomed to the technique of generating high maximal inspiratory pressures; this is referred to as the training effect. This is a confounding variable that could compromise the internal validity of the study.

The researchers account for why the secondary aim of the study was not met. The measurement for self-efficacy (the CSES) was inadequate for the purpose it was intended for. The researchers acknowledge the study's limitations – the relatively small sample size (n= 31). The strict inclusion criteria effects external validity as the findings cannot be generalised to patients with HF and coexisting COPD which is prominent in the population. This is acknowledged as a potential source of error.

The study contributes to an evidence base for the use of IMT as an additional treatment for stable HF and provides recommendations for future research.

Word count: 1100

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