

# Size and Direction of Effects Between Life Values and Pain

A. Kincaid<sup>1</sup> and L. Lee Glenn

*College of Nursing, East Tennessee State University, Johnson City, Tennessee 37614*

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## **Abstract**

Nilsson, Denison and Lindberg [1] concluded that their findings suggest a link between intra-individual factors and different aspects of appraised life values and musculoskeletal pain. However, (1) the direction of the effect could not be determined nor assumed due to the use of non experimental methods, and (2) there was Type II error because  $p$  values due lack of adjustment for multiple comparisons, and (3) the effect sizes are very weak. Action should not yet be taken by individuals, clinics, hospitals or government policies regarding the link between pain and life values until better evidence is obtained on this critical issue.

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The recent study by Nilsson, Denison and Lindberg [1] concluded that “the results suggest that there might be a link between intra-individual factors reflecting different aspects of appraised life values and musculoskeletal pain (MSP).” However, this conclusion is not supported by the findings in the study because (1) the direction of the effect cannot be determined from correlation studies. (2) There was no correction in the  $p$  values for multiple hypothesis testing, and (3) the effect sizes are very weak.

Regarding direction of effect, no evidence was presented to rule out the possibility that the amount of pain, disability, and sick leave diminished social relations, psychological well-being, and physical self-care, rather than the other way around.

Although experimental designs that could determine direction of effect may not be feasible for these types of studies, it is important that the conclusion statements are worded to take this into account.

Regarding  $p$  value correction, the authors mention this problem on Page 8, first paragraph that “the sample size may have affected the outcomes. Bonferroni corrections were not applied because of low power in the main analysis due to dichotomization of the dependent variables.” However, low power due to dichotomization of variables is no reason to skip the Boniferroni or other types of correction. Applying the Bonferroni correction for multiple comparisons, there are 27 statistical tests for nine independent variables (family relation, married, ... ) and three dependent variable (which are pain, disability and sick leave), so the findings in any one test must be below a  $p$  of

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<sup>1</sup>Corresponding Author: Adam Kincaid, College of Nursing, East Tennessee State University, Johnson City TN 37614 USA. Email: kincaida@goldmail.etsu.edu.

0.05 divided by 27, or  $p < .00185$ . By this criterion, only one of the findings would be statistically significant instead of six, namely the relation of physical self-care.

Regarding effect size, for ease of interpretation, the key findings in Table 4 of the study were transformed into standardized effect size percentages by the formula  $r = 100 \cos(\pi/(1+o^{1/2}))$ , where  $o$  is the odds ratio and  $r$  is the correlation coefficient. The effect size for the strongest relationship was  $r = 0.11$  or 1%. This is a very weak effect size by any measure. The effect sizes for the five other relationships that were considered to be statistically significant in the study ranged between 5% and 7%, with a combined effect size for all 27 relationships of only 3.4% by the Fisher transform. Clearly, despite their potential importance, life values have little or no relationship to the amount pain, disability, or sick leave as measured in the study.

The study had many strengths, including a large sample size, good measurement reliability, three-year longitudinal design, and excellent comparison of the data with previous findings. Due to use of a correlation design, lack of correction for multiple tests, and very low effect sizes, it lacked the

evidence needed for the conclusion statement that was drawn. The researchers were aware of many of the limitations to the study, as indicated by statements within the study, but drew over-reaching conclusions that did not take them into account. We suggest the replacement conclusion statement, "Measures of life values and of pain and disability have little or no interrelationship in this particular sample of nurses". Therefore, action should not be taken by individuals, clinics, hospitals or government policies until better evidence is obtained on this critical issue.

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## REFERENCES

1. Nilsson A, Denison E, Lindberg P: Life values as predictors of pain, disability and sick leave among Swedish registered nurses: a longitudinal study. *BioMed Central* 2011, 10:17.