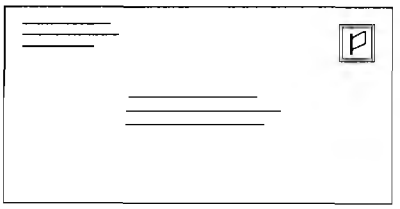


Recently I happened to read the November 1991 issue of your journal. In this issue, an article was published titled "A study to compare the ventilation patterns produced with intermittent positive pressure breathing to those produced by deep breathing" by C J Eales et al.. It concluded that "contrary to the claims put forward to support the use of IPPB to increase alveolar ventilation, we feel that deep breathing exercises would be just as effective". While this may be the case, the study itself does not allow this conclusion to be drawn.

Firstly, let me state that I do not have an interest in either IPPB or in Deep Breathing (DB). Instead, my interest lies in research and epidemiological methods.

The study was set up as a randomised clinical trial. As such it should have compared two different treatment modalities in otherwise comparable groups established by a random allocation process. In addition, both the patients and the researchers should have been masked ("blinded") if at all possible.

As it stands, however, the article does not state how randomisation was achieved, nor does it state whether or not the researchers were masked (blinded), so that the reader has to assume that they were not. And, since there are four co-researchers, the article should have indicated the functions performed by each, and should have mentioned how inter-observer variability was dealt with.

In addition, the IPPB group used a different manner of breathing (mouth piece and nose clip) from those in the deep breathing group (face mask). Ideally, the method of administration should be the same in both groups. However, if this difference is essential to the two methods being used, then the study is not just comparing two different breathing methods but also two different inhalation apparatus.

In the statistical analysis, insufficient information is provided: no mention is made of which statistical test was used, nor of the means and standard error values obtained, so that it is impossible for any reader to confirm the correctness of the statistical results.

The most fundamental problem with this study, however, is that the authors did not calculate the power of the study to demonstrate a difference between IPPB and DB. In statistical terminology, the study did not indicate the probability of a type II or ß error, i.e. the probability of NOT rejecting the null-hypothesis is false. In simpler terms, even if there really is a difference between IPPB and DB, the sample sizes used may have been too small to demonstrate such a difference.

To do a power calculation for this study, one would need to know the standard errors of the two samples separately, or the pooled standard error, neither of which were given. I therefore assumed a standard error of ten counts/pixel for each sample to illustrate the use of a power calculation: if the real difference between IPPB and DB was one count/pixel, the power of this particular study to detect this difference (i.e. to reject the null-hypothesis) is 0.06 (6%) ... or, in 94 out of a 100 such studies the null-hypothesis will NOT be rejected even though there is a real difference. Only if the real difference between IPPB and DB is at least nine counts/pixel (approximately 30% difference between IPPB and DB) would the power of the study fall within conventionally acceptable levels: i e be more than 0.80 or 80%. A proper conclusion of the study could have been: "our study could not demonstrate that IPPB was at least 30% better or worse than DB".

In summary, the presentation of the study is incomplete and does not allow the reader to verify the findings of the researchers. Furthermore, the design and execution of the study make it possible that a host of biases were included, and the sample size was almost certainly too small to come to a reasonable conclusion that "IPPB does not work better than DB". The study should therefore be repeated if this is an issue of importance.

by Dr Carel Ijsselmuiden
Department of Community Health Medicine MEDUNSA

Reply to Dr Ijsselmuiden by Mrs C J Eales, Department of Physiotherapy, University of the Witwatersrand

On admission to the Department of Nuclear Medicine patients were randomly selected into group A or B by taking either a red or blue button from a cup. The two treatment groups were comparable as all the patients had suspected pulmonary emboli.

Three researchers were needed to carry out the scanning procedure. One operated the computer, one positioned and instructed the patient and a third controlled the amount of Krypton 81m gas that was being administered by opening and closing the tap. The same operator always carried out the same procedure. An independent researcher evaluated the results.

When doing deep breathing exercises a free flow of air is available and using a face mask is the best way of administering Krypton 81m while supplying a free flow of air. IPPB is always administered with a mouthpiece with obvious resistance. In addition the air is delivered under pressure to the patient.

In using the experimental method we could closely simulate the conditions as they would occur in the clinical situation and our interest lay in the evaluation of these methods clinically.

Our results were analysed by the method described by Bisson et al. The data was analysed using the Mann-Whitney U test. This test was selected due to the fact that it avoids the assumption made that the subject population is normally distributed. It was chosen to compare two independent groups to see whether they have been drawn from the same population. This test is also suitable for small population groups. Our results were analysed by the Medical Research Council and we feel confident that we can in fact postulate that from a clinical point of view there is no significant difference between Deep Breathing Exercises and IPPB.

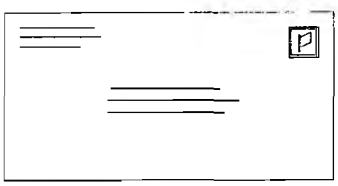
References:

Bisson F, Drapeau G, Lamoureaux G, Cantin A, Rola-Pleszcynski M, Begin R. Computer-based Quantitative Analysis of Gallium-67 Uptake in Normal and Diseased Lungs. *Chest* 1983;84:513-517.

Editorial Comment:

This article has created a great deal of interest and comment. The authors do however confirm that they do not berate the use of IPPB where it is obviously indicated. In South Africa IPPB is often used indiscriminately and in lieu of other more effective respiratory techniques, rather than as an adjunct to treatment. As the article implies, physiotherapists should be aware of the strengths and weaknesses of IPPB.

J C Beenhakker



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