Author's response to reviews

Title: Critical appraisal skills training for health care professionals: A randomized controlled trial

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Development and validation of a questionnaire to evaluate the effectiveness of evidence-based practice teaching

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Aim The aim of this study was to develop and validate a questionnaire to evaluate the effectiveness of evidence-based practice (EBP) teaching.

Methods The 152 questionnaires completed by health care professionals with a range of EBP experience were used in this study. Cronbach’s alpha for the knowledge and attitude questions indicated a satisfactory level of internal consistency (i.e. >0.60).

Results The discriminative validity was evidenced by a statistically significant difference in the knowledge and attitude scores of ‘novices’ (i.e. little or no prior EBP education) compared with ‘experts’ (i.e. health care professionals and academics currently teaching EBP). Moderate to good (≥0.4) sensitivity index scores were observed for both knowledge and attitude scores as the result of comparing individuals before and after an EBP intervention.

Conclusions The results of this validation study indicate that the developed questionnaire is a satisfactory tool with which to evaluate the effectiveness of EBP teaching interventions.

Keywords Education, medical, *methods; educational measurement; evidence based medicine; *questionnaires, reliability and validity of results; teaching, methods.

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Introduction

Evidence-based practice (EBP) teaching is now incorporated as an integral part of many undergraduate medical education programmes. 1 The objective of these programmes is to provide practising health care professionals with the skills necessary to critically appraise literature and practice in an evidence-based way.

A recent systematic review of EBP training indicated that, although generally supportive of the benefit of such training, the designs of the evaluations were such that the results were likely to have been prone to substantial bias. 2 Moreover, only one of these studies reported using a validated outcome measure, and no details of the validation process were described. 3 The development of valid and reliable outcomes is a major issue in the field of current health care educational effectiveness.

Methods

Development of the questionnaire

Items to assess knowledge and attitudes, for inclusion in this questionnaire, were identified from a systematic review of the literature 2 and adapted from a previous (unvalidated) EBP questionnaire. 4

A total of 11 multiple-choice knowledge questions were designed using ‘true’, ‘false’ or ‘don’t know’ response categories. Correct responses to the knowledge questions were given a score of 1, and incorrect responses were scored negatively (i.e. a score of −1) to dissuade participants from guessing, and to maximize

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the spread of scores. Respondents who answered ‘don’t know’ were given a score of 0. The knowledge scores were summed to obtain the ‘overall knowledge score’.

The 14 attitude statements which were included were designed using a Likert scale. Each statement was scored on a five-point scale, such that a participant strongly agreeing with a ‘positive’ statement, or strongly disagreeing with a ‘negative’ statement, was given a score of ‘5’. Conversely, a participant strongly disagreeing with a ‘positive’ statement, or strongly agreeing with a ‘negative’ statement, was given a score of ‘1’. The attitude questions were summed to obtain an ‘overall attitude score’.

Item reduction

It was important that the questionnaire be both short and easy to complete. A total of 20 health care professionals with varying degrees of experience of EBP, in addition to completing the questionnaire, were invited to make comments regarding its overall format, and specifically about whether any of the questions caused particular problems. On the basis of this, minor modifications to the layout and wording were made and the numbers of attitude and knowledge questions were reduced to seven and six, respectively (each of the six knowledge questions consisted of three components). The possible range of scores for the attitude questions was 7 to 35, and for the knowledge questions it was −18 to +18.

Study population

The questionnaire was administered to the following four groups:

- group 1: health care professionals with little or no prior EBP education, but who were in the process of applying to undertake an EBP intervention;
- group 2: health care professionals who had undertaken an EBP intervention within the last 4 weeks;
- group 3: health care professionals who had undertaken an EBP intervention within the last 12 months, and
- group 4: health care professionals and academics currently teaching EBP, and who had attended the 1997 Oxford Centre of Evidence Based Medicine workshop.

In the cases of groups 1, 2 and 3, the EBP intervention was a Critical Appraisal Skills Programme (CASP) workshop. In all cases, the questionnaires were administered by post. In addition to the questionnaire, each participant received a set of instructions explaining the purpose of the study, and a stamped addressed envelope in which to return the questionnaire.

Internal consistency

This was assessed by average inter-item correlation from the results from all four groups, to which Cronbach’s alpha and Spearman’s correlation coefficient were applied.

Discriminative validity

Discriminative validity (the strength of relationship between the instrument and external criteria) was assessed by comparing the total mean knowledge and total mean attitude scores of group 1 with group 4, i.e. comparing a group which could be considered to be ‘EBP novices’ with a group which could be considered as ‘EBP experts’.

Responsiveness

Responsiveness (the extent to which an instrument is able to detect change) was assessed on the basis of comparing group 1 with groups 2 and 3, i.e. was taken to be equivalent to a ‘before’ versus ‘after’ comparison. A sensitivity index was calculated for the mean difference divided by the standard deviation of the group 1 vs. group 2 and 3 scores. Values of <0.3 indicated poor sensitivity, values of 0.4–0.6 indicated moderate sensitivity, and >0.6 indicated good sensitivity.

For all analyses, statistical significance was taken at P < 0.05 level. Parametric and distribution-free methods were used throughout the analyses. Where no major discrepancies between the two approaches were found, the results of parametric tests are reported.
<table>
<thead>
<tr>
<th></th>
<th>Attitude</th>
<th>Knowledge</th>
</tr>
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<tbody>
<tr>
<td>Group 1, mean (SD)</td>
<td>23.3 (4.8)</td>
<td>4.3 (5.0)</td>
</tr>
<tr>
<td>Group 4, mean (SD)</td>
<td>27.7 (4.0)</td>
<td>12.4 (4.2)</td>
</tr>
<tr>
<td>Difference, mean (95% CI)</td>
<td>−4.5 (−6.5 to −2.5)</td>
<td>−8.1 (−10.3 to −6.0)</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<tr>
<td>Group 1, mean (SD)</td>
<td>23.3 (4.8)</td>
<td>4.3 (5.0)</td>
</tr>
<tr>
<td>Group 2, mean (SD)</td>
<td>26.0 (3.0)</td>
<td>6.5 (4.2)</td>
</tr>
<tr>
<td>Difference, mean (95% CI)</td>
<td>−2.8 (−5.8 to 0.1)</td>
<td>−2.2 (−5.4 to 0.9)</td>
</tr>
<tr>
<td>P value</td>
<td>0.056</td>
<td>0.156</td>
</tr>
<tr>
<td>Sensitivity index</td>
<td>0.72</td>
<td>0.48</td>
</tr>
</tbody>
</table>

**Results**

A total of 152 completed questionnaires were used for this study: group 1, 50; group 2, 12; group 3, 57 and group 4, 33.

**Internal consistency**

Satisfactory values were obtained for Cronbach’s alpha for the knowledge questions and attitude questions, of 0.72 and 0.64, respectively. Spearman’s rank correlation coefficients for each knowledge and attitude question individually, and against the total knowledge and attitude scores ranged from 0.12 to 0.66.

**Discriminative validity**

A statistically significant difference was observed in both total attitude and knowledge scores of groups 1 and 4 (see Table 1). The distribution of scores across the groups indicate little evidence of either a marked ‘floor’ effect (i.e. a high proportion of participants achieving the worst or near to worst score), or a marked ‘ceiling’ effect (i.e. a high proportion of participants achieving the best, or near to best score).

**Responsiveness**

Sensitivity indices derived from comparisons of group 1 with both groups 2 and 3 indicated moderate to good levels of responsiveness for both attitude and knowledge (see Table 1).

**Discussion**

To the knowledge of the authors, this is the first study both to develop and undertake a detailed validation of a questionnaire to assess the impact of EBP training.

The instrument has been shown to have moderate to high levels of internal consistency, discriminative validity and responsiveness. The results suggest that the questionnaire is a valid tool for measuring the impact of EBP training on participants’ knowledge, and attitudes toward EBP.

Further work is required in testing this questionnaire as an appropriate outcome in the evaluation of different EBP educational interventions.

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Copies of the evaluation questionnaire are available from the following website address: http://www.lshtm.ac.uk/php/hsru/phpcasp

**Contributors**

RT and RM conceived and jointly wrote the paper. BR, PE, SB and RT conceptualized the trial of which this validation study was a part. JK, SB and RM collected the validation study data. All authors commented on drafts of the paper. RT is the guarantor.
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References


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