THE DEVELOPMENT OF A WEIGHTED OBJECTIVE RESEARCH CRITERION ASSESSMENT TOOL (WORCAT)

I Treadwell

ABSTRACT

The aim of this study was to develop an instrument to evaluate research reports objectively according to set criteria, relative weights and critical errors. A tentative instrument was compiled and copies were sent to 144 university lecturers and senior lecturers at South African Nursing Science Departments in order to determine:

- *the face validity of the assessment criteria of the 18 stated aspects of research reports*
- *the weight or relative value of each of the aspects*
- *how relationships between aspects should be evaluated*

The relative value of each of the 18 aspects was determined by completing a matrix on which aspects were compared. The Analytic Hierarchical Procedure was used to determine the weight of each aspect.

The WORCAT was developed from the findings and the most striking feature is the high relative weight allocated to each of the following aspects of research reports:

recommendations = 20 %; conclusions = 10 %
literature study = 10 %; problem statement = 7 %

The reliability of the WORCAT still needs to be tested.

OPSOMMING

Die doel van die studie was om 'n instrument te ontwikkel om navorsingsverslae objektief volgens gestelde kriteria, relatiewe gewigte en kritiese foute te evalueer.

'n Tentatiewe instrument is opgestel en aan 144 lektore en senior lektore verbonde aan Departemente van Verpleegkunde aan Suid-Afrikaanse Universiteite gestuur om:

- *die siggeldigheid van die ramingskriteria van die gegewe agtien aspekte van 'n navorsingsverslag te bepaal*
- *die relatiewe gewigte of waardes van elke aspek te bepaal*
- *te vas te stel hoe die verwantskappe tussen die aspekte evalueer behoort te word.*

Die relatiewe waarde van elke aspek is bepaal deur die voltooiing van 'n matriks waarop die aspekte teen mekaar opgeweeg is. Die gewig van elke aspek is per rekenaar bepaal en wel deur middel van die Analitiese Hierargiese Prosedure.

Die WORCAT is ontwikkel uit die bevindinge waarvan die mees uitstaande kenmerk die hoë relatiewe gewigte is wat aan die volgende aspekte toegeken is:

aanbevelings = 20 %; bevindinge = 10 %
literatuurstudie = 10 %; probleemstelling = 7 %

Nursing research is the scientific approach that offers important resources for answering difficult clinical and health-related questions (Wilson 1983). Only by discovering these problems in our practice and finding solutions by means of research can we shape a profession based on meeting the needs of those we serve.

However, when we judge research findings we do not primarily focus on answering research questions but rather on the research process and the product of that endeavour (Duffy 1985). The focus should be on the merit and worth of the recommendations as well as the possibility of incorporation into clinical practice (Beck 1990). This means that a research report should not be judged merely by evaluation of the report against criteria based on the research process but that more emphasis should be placed on the conclusions and recommendations since they indicate how the problem manifests and could be solved.

Just as the recommendation of solutions is of utmost importance to the researcher, the matter of objectivity cannot be overemphasised in the case of the evaluator. Although objective evaluation of a research report is extremely difficult it is vitally important; not only to be fair to students who submit research reports as part of requirements in obtaining degrees but also for the awarding of grants and prizes.

Problem statement

No instrument which makes provision for objective as well as weighted assesment of quantative research reports exists.

Aim

To develop an instrument to evaluate quantative research reports objectively according to set criteria and relative weights.

Objectives

- Carry out literature study and compile a tentative instrument comprising evaluation criteria for all the aspects of a research report.

- Do a survey amongst lecturers of nursing research to determine
  - the face validity of the evaluation criteria included in the instrument
  - the relative weight or relative value of each of the aspects of a research report
- Compile the WORCAT (Weighted Objective Research Criteria Assessment Tool) by adjusting the tentative instrument according to the findings

Literature review

A research critique is viewed as a critical appraisal of a research study that has been systematically reviewed based on some known criteria (Beck 1990). Critical research appraisals have been addressed by several authors who agree on the importance of appraising research critically but disagree on the best way of doing so (Duffy 1985).

Leininger (1968) identified a few guidelines for doing a critique but does not define the acceptable criteria. Ward and Fetler (1979) go a step futher and provide an extensive checklist of aspects to be considered. The value of the checklists is not only to remind the reader of the many features which should be appraised but should also improve the degree of objectivity (Binder 1981). Although checklists are valuable they have shortcomings because they are developed by individuals to help them evaluate their own and others' reports and to help readers understand and learn from reports. They are therefore not complete lists of all criteria and appraisals of criteria are based on the evaluator's knowledge of the research process (Duffy 1985).

Limitations

Rating of research criteria depends on the research expertise of the rater.

The completion of the matrix was not well understood which made it difficult to complete and resulted in a low return rate.

Method

A literature study was done in order to list the different aspects a research report should comprise as well as the criteria for each of the aspects. A tentative research evaluation instument was compiled from resources and was sent to colleagues to obtain their evaluation of the contents of the instrument (Burns and Grove 1987; Polit and Hungler 1983; Wilson 1983).

A questionnaire was compiled to obtain information on the respondent's highest academic qualification, involvement in lecturing and evaluation of research reports as well as number of published papers. Since the tentative evaluation instrument did not make provision for the evaluation of relationships between different aspects of a research report, questions were set on how to deal with these relationships.

A matrix was drawn up comprising 18 aspects of a research report on both the horizontal and the vertical columns (Fig. 1).

Aspects	Tit	Pro	PrS	Sig	P&H	Lim	Ass	L&T	Des	Met	Sam	Ins	DaA	Dis	Con	Rec	Bib	Gen
Tit																		
Pro																		
PrS																		
Sig																		
P&H																		
Lim																		
Ass																		
L&T																		
Des																		
Met																		
Sam																		
Ins																		
DaA																		
Dis																		
Con																		
Rec																		
Bib																		
Gen																		

KEY

Tit = Title
Pro = Problem/Motivation/Introduction
PrS = Problem Statement
Sig = Significance to nursing
P&H = Purpose/Objectives and/or hypothesis
Lim = Limitations
Ass = Assumptions
L&T = Literature review and/or theoretical/conceptual framework
Des = Design
Met = Method
Sam = Sample
Ins = Instruments
DaA = Data analysis
Dis = Discussion of findings
Con = Conclusions
Rec = Recommendations
Bib = Bibliography and references
Gen = General eg. writing style, logical order

A hypotheses is not necessarily stated, therefore the weight is added to that of the "Purpose"

FIGURE 1. MATRIX: RELATIVE WEIGHTS OF ASPECTS OF A RESEARCH REPORT.

Respondents were requested to assign weights to the aspects by comparing each of the aspects in the vertical column with each of the aspects listed in the horizontal column. The weight should be the value of the vertical aspects relative to the value of the horizontal aspects and indicated as in Fig. 2.

Aspects	Title	Limitations	Conclusions
Title	1	2 (Square 1)	1/3 (Square 2)
Limitations		1	
Conclusions			1

FIGURE 2. EXAMPLE OF WEIGHTING SOME OF THE ASPECTS OF A RESEARCH REPORT.

Table 1 : Research involvement of the respondents (n = 23)

	Experienced (n=7)	Inexperienced (n=16)	Total (n=23)
Highest academic qualification :			
* Doctoral degree	5	4	9
* Masters degree	2	11	13
* B Cur (Hons)		1	1
Mean number of years lecturing	6,3	2,3	3,5
Mean number of reports evaluated	126	41	67
Mean number of publications	4	0,4	1,1

- The weight of an aspect compared to itself will always be 1 (shaded squares).
- If the aspect in the vertical column is considered to be more important than the aspect in the horizontal column, then the weight allocated will be 2, 3, 4 or 5.

Example - Square 1:

If the aspect "title" (vertical column) is considered to be twice as important for research report evaluation as "limitations" (horizontal column), the weight would be 2.

* If the aspect in the vertical column is considered to be less important than the aspect in the horizontal column the weight will be 1/2, 1/3, 1/4, or 1/5, depending on how many times the aspect in the horizontal column is more important.

Example - Square 2:

If eg. "title" (horizontal column) is compared with "recommendations" (vertical column) and "recommendations" is considered to be three times as important the "title", the weight of "title" will be 1/3.

A namelist of all lecturers and senior lecturers at South African Universities was obtained and a tentative research evaluation instrument, questionnaire and matrix were sent to 144 lecturers.

Data analysis

Only 33 lecturers responded which gives an extremely low return rate of 23 %. Of these 33 only 23 completed the matrix correctly. Since the respondents' research involvement varied extremely it was decided to divide the sample into experienced and inexperienced groups since the determination of relative weights of aspects of a research report in particular required some experience. It was decided arbitrarily that the criteria for the experienced group would be at least two years of teaching nursing research, 20 evaluations of research reports done and one publication. Data on the two groups' involvement in research appear in Table 1.

Of the experienced group 71 % have doctoral degrees compared to the 25 % of the inexperienced group. Respondents in the experienced group have on average 4 more years of lecturing experience, evaluated 85 more research reports and published 3,6 more reports than respondents in the inexperienced group.

Aspects of a report that should be evaluated as well as their assessment criteria were identified from literature (Burns & Grove 1987; Polit & Hungler 1983; Wilson 1983). These aspects were limited to 18 since the computer programme used for determining the relative weights could accomodate a maximum of 18 different aspects. The aspects and the assessment criteria for each are listed in Figure 3. The criteria added by the respondents to those identified from literature were few and are indicated with asterisks (*).

The relative weights for each of the 18 aspects of a research report were determinded by means of the Analytic Hierarchical Procedure a software programme developed by T.L. Saaty. The values of the 18 weights add up to 100. The relative weights allocated by the experienced and inexperienced groups are given in Table 2.

It was interesting to note that the two biggest differences in relative weights allocated by the two groups were for the problem and recommendations. The experienced group allocated 4 more for problem statement and 10 more for conclusions which underlines the two main components of Wilson's view of nursing research i.e it is the approach that offers resources for answering questions (Wilson 1983).The relative weights for each of the 18 aspects of a research report, as determined by the experienced group, are indicated as maximum scores on the evaluation instrument (Fig 3). The maximum score for each aspect was divided arbitrarily between the criteria which were to be met. It would be possible to determine the relative weight of each criterion of an aspect in the same way as the weights for the aspects of a research report were determined.

Respondents were requested to comment on relationships between different aspects of a research report. Table 3 reveals their opinions on whether the relationships between the stated aspects should be taken into consideration or not. Suggestions could be made for additional relations to be evaluated.

Table 2 : Relative weights of aspects of research reports

Aspects of research report	Experienced	Inexperienced
Title	1	2
Problem/motivation/introduction	4	4
Problem statement	7	3
Significance to nursing	4	5
Purpose/Objectives	6	5
Limitations	4	4
Assumptions	4	5
Literature	10	9
Design	3	8
Method	6	7
Sample	4	5
Instruments	3	4
Data analysis	4	6
Discussion of findings	6	6
Conclusions	10	10
Recommendations	20	10
Bibliography	2	3
General	2	4
Total	100	100

Table 3 : Respondents' views on relationships between aspects of a research report that should be considered (n = 18)

Related aspects	n	Yes	No
Title and recommendations	17	16	1
Objectives and findings	18	17	1
Data analysis and findings	18	18	0
Hypothesis and principal problem	18	14	4

Only three repondents added additional relationships to be evaluated. Two suggested that all aspects should be related and one stated that in addition to the four relationships stated in Table 3 the relationship between data analysis and recommendations should also be evaluated.Respondents were also requested to indicate whether relationships between aspects of a research report should be evaluated by either

- allocating a certain percentage of the total marks to the evaluation of relationships or;
- deducting a certain percentage from the total marks obtained from the criterion evaluation should aspects not relate.

Only 74 % of repondents gave their opinion on how relationships between aspects of research reports should be evaluated:

- 59 % advocated the allocation of a certain percentage and the average percentage suggested was 29.
- The deduction of (on average) 14 % from the total marks was suggested by 41 % of the respondents should relationships be inadequate.

Findings

Respondents' involvement in research varied to such extent that they were divided into an experienced group and an inexperienced group. Criteria for inclusion in the experienced group were a minimum of two years of teaching nursing research, 20 evaluations of research reports and one published research report.

Very few additions were made to the tentative research assessment instrument by the two groups. The instrument comprised evaluation criteria for eighteen aspects of a research report.

The relative weights allocated to the eighteen aspects of a research report by the two groups varied considerably especially pertaining to problem statement and conclusions. The experienced group allocated 4 and 10 more marks respectively for these two aspects. The experienced group allocated a relative weight of 20 to recommendations which meant that 20 % of marks given for a research report will be for the recommendations made.

The WORCAT (Weighted Objective Research Criteria Assessment Tool) was compiled by listing each aspect with its evaluation criteria together with its relative weight as maximum score.

In addition to the weighted assessment of criteria the relationships between aspects should also be evaluated. This should be done by allocating 29 % of the total marks to relationships as recommended by 59 % of the 17 respondents who responded to this part of the questionnaire. The remaining 41 % were of the opinion that 14 % should be deducted from the total marks.

Conclusions

The WORCAT seems to have face validity since few additions were made to the tentative instrument comprising evaluation criteria for all aspects of research reports.

The relative weights allocated to different aspects of a research report emphasized the importance of identifying a relevant research problem clearly and making appropriate and valid recommendations to solve the problem.

Opinions of the respondents on how to evaluate relationships between aspects of a research report varied widely and neither of the two can be recommended.

Recommendations

Further research should be done to determine

- the validity and reliability of the WORCAT
- ways and means of dealing with relations between aspects of a research report.

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I. TREADWELL
Senior lecturer
Department of Nursing
University of Pretoria

Title: _____
Researcher(s): _____

ASPECT OF REPORT	WEIGHT (Maximum score)	ASSESSMENT CRITERIA	SCORE
Title	1	Descriptive of the study/reflects problem Clear and precise Reflects variables Reflects population	
Problem/motivation/ introduction	4	(1) Stated clearly (1) Relevant to nursing (1) Logical and coherent * (1) Gives context of problem	
Problem statement	7	(1) Stated in a complete grammatical sentence (2) Clear - not open to misinterpretation (1) Concise (3) Terms operationally defined	
Significance to nursing	4	(2) Study can make a difference to professional nursing/education/administration (2) An indication is given of the significance of the study	
Purpose Objectives Hypothesis	6	[2] (1) Aim and objectives stated clearly [1] (0,5) Relevant [1] (0,5) Feasible [1] (0,5) Measurable [1] (0,5) Coherent with problem/motivation (If not stated, use maximums given in brackets [] for "Purpose") (0,5) Stated clearly (1) Related to the principal problem (0,5) Appropriate for the design (0,5) Testable by quantifiable data (0,5) Capable of answering the research question	
Limitations	4	Stated Appropriate	
Assumptions	4	Stated Appropriate	
Literature review	10	[2] (1)Relevant to the problem statement [2] (1)Sufficient/comprehensive [1] (0,5) Resources published during the past 5 years included (Historical research :score for primary resources used) [1] (1)Written in clear, logical and organized manner [1] (1)References documented completely, correctly [1] (0,5) References documented consistently [2] (1)In context with problems/objectives	
Theoretical/ conceptional framework		(If not given, allocate marks given in brackets [] for literature review) (2) Clear framework provided (2) There is a rationale for using the given framework	
Design	3	(1) Well described (2) Appropriate for the research question	
Method	6	(1) Clearly described (2) Sufficient detail/comprehensive (2) Appropriate for the design (1) Informed consent obtained	
Sample	4	(1) Method of sampling clear (1) Adequate size for generalization and projection (2) Appropriate	
Instruments	3	(1) Appropriate/suitable (1) Tested for validity (1) Tested for reliability	
Data analysis	4	(0,5) Accurately and orderly presented (1) Correctly tabulated (0,5) Tables complete and self explanatory (0,5) Graphic presentation done (0,5) Graphs complete and self-explanatory (0,5) Graphic presentation enhanced the impact (0,5) No data omitted/disregarded	
Discussion of findings	6	(2) Statistical data interpreted (2) Logical interpretations (2) In context with analyzed data	
Conclusions	10	(2) Summary of findings provided (3) Justified by the findings (3) Related to the problem statement (2) Stated clear and concise	
Recommendations	20	(4) Implications of the findings suggested (4) Clear and reasonable (3) Meaningful (4) Realistic (5) Generalizations appropriate to design & sampling techniques	
Bibliography	2	(0,5) Consistent style (0,5) In alphabetical order (1) All information given according to recognized method	
General	2	(1) Grammar & writing style conductive to understanding report (0,5) Written in a logical order (0,5) Appearance neat	
TOTAL	**100**		

Figure 3: WORCAT: Weighted Objective Research Criterium Assessment Tool