A Comparison of Multi-item Likert and Visual Analogue Scales for the Assessment of Transactionally Defined Coping Function

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Abstract

The evaluation and monitoring of interventions that are designed to alleviate psychosocial stress are largely reliant upon subjective assessments of coping as primary outcome measures. The pros and cons of different response formats used to measure coping variables are unexplored; yet arguably, response format is a very important methodological issue for the clinical application and evaluation of psychosocial interventions. This study compared the levels of functional coping and transactional coping patterns assessed with multi-item 7-point Likert Scales (LS) and 65 mm Visual Analogue Scales (VAS), within the framework of the Functional Dimensions of Coping (FDC) Scale developed by Ferguson and Cox, 1997. LS yielded significantly higher levels of functional coping for all four subscales, and captured a wider range of transactional coping patterns for the approach, emotion, and avoidance coping functions than VAS. The authors recommend the use of LS for baseline assessments of transactionally defined coping function within the FDC framework.

Keywords

Stress, Coping Function, Likert Scale, Visual Analogue Scale, Functional Dimensions of Coping
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INTRODUCTION

Coping is quintessentially a subjective phenomenon and relies heavily upon self-report assessments (with the exception of physiological or behavioural observation measures used in concordance and laboratory studies) obtained from a perennially growing number of psychometric inventories and questionnaires. The data obtained from these instruments are then used to evaluate psychosocial interventions, or for monitoring any changes in respondent status following the delivery of therapeutic activity targeting the acquisition of adaptive coping responses to salient life stressors. Consequently, valid and reliable assessments of coping are essential to detect any significant improvement (or deterioration) in status, and evaluate the effectiveness of interventions within randomised controlled trials.

One of the primary methodological issues for the delivery and evaluation of interventions is the selection of the optimal response format for variable measurement (Guyatt, Townsend, Berman & Keller, 1987). However, due to the paucity of research devoted to elucidating any differences between different response formats, the selection of the most efficacious method for data collection remains inconclusive (Brunier & Graydon, 1996). Consequently, response format selection is frequently based upon considerations of face validity and subjective researcher preferences. Worryingly, this may result in any apparent differences (or lack thereof) reported for the utility of interventions within controlled trials or clinical contexts, being confounded by the method used for data collection (Joyce, Zutshi, Hrubes & Mason, 1975).

Two of the most common response formats used to measure subjective phenomena are fixed-interval Likert Scales (LS) and Visual Analogue Scales (VAS). Discrete response formats such as LS typically have seven graduated categories to choose from, anchored with descriptive
Comparison of Likert phrases representing the absolute minimum and maximum responses possible (intermediate graduations represented by descriptive phrases or numbers are typically included). A participant selects a category (e.g., not coping, coping better, coping very well) most representative of their perceived status. Continuous response formats such as VAS are typically presented as a 10 cm horizontal line, anchored with two verbal descriptors at the extremes (e.g., not coping and coping very well) where respondents indicate their perceived status by placing a mark along the horizontal line at the most appropriate point.

VAS are considered to reduce the confounding effect of variation between individual interpretations of the graduations used for LS (Brunier & Graydon, 1996); to be preferred by participants who perceive their desired response as not corresponding with LS graduations (Holmes & Dickerson, 1977), and enable a finer distinction between subjective states to be made (Duncan, Bushnell & Lavigne, 1989). VAS require the respondent to consider their status within a mathematical dimension, a task which many participants may find difficult (Duncan et al., 1989; Joyce et al., 1975). Indeed, several studies have reported that respondents required (or received) training in the correct use of VAS (Guyatt et al., 1987; Jaeschke, Singer, Gordon & Guyatt, 1990; Murphy, McDonald, Power, Unwin & MacSullivan, 1988; Nyren, Adami, Bates, Bergstrom, Gustavsson, Loof, & Sjoden, 1987). Furthermore, it has been proposed that data obtained from VAS are no more reliable or valid to justify the extra work needed to analyse the results (Joyce et al., 1975). The potential extra time needed for participant instruction and data analysis seriously hinders the utilisation of VAS, as the key requirements of variable measurement within clinical practice are simplicity, brevity, rapid completion, and ease of scoring (Bellamy, Campbell & Syrotuik, 1999a, 1999b).
Conversely, LS are reported to be relatively simple to learn (e.g., Jaeschke et al., 1990) and participants may be helped to mark a response by providing meaningful categories from which to choose (Scott & Huskisson, 1977). Furthermore, it has been suggested that LS enable researchers and clinicians to interpret relevant changes more easily; for example, a shift of 20 mm on a VAS is more difficult to interpret clinically than a shift to another discrete category on a LS (Guyatt et al., 1987). Suggested disadvantages of LS are that participants may be undecided which category to choose if the categories are not representative of their perceived status (Brunier & Graydon, 1996). Similarly, discrete categories may not have the same meaning for every participant; therefore, a presumption of equal graduations may result in an inappropriate variable measurement, as a participant is forced to choose the closest approximation (Duncan et al., 1989). Qualitative data obtained from participants revealed that those who preferred VAS stated that VAS were “more accurate, sensitive, and less biased”; preferences for LS were based on the perception they were “more definite, easier, and required less imagination” to complete (Joyce et al., 1975, p. 419).

Consequently, it is postulated that LS and VAS may differ in terms of specific properties when they are used to assess subjective phenomena, such as data equivalence, reproducibility, and responsiveness. We propose that data equivalence is the ability of different response formats to measure subjective phenomena in a comparable way. This includes (a) psychometric structure, (b) scores obtained for particular dimensions of functional coping and (c) patterns of associations between functional coping and self-reported coping styles.

According to Brunier and Graydon (1996) reproducibility refers to the test-retest reliability (repeatability) of measurements obtained from response formats; it is assumed that LS possess
greater reproducible than VAS, due to a large change in status required for shift to another intermediate point on LS (Brunier & Graydon, 1996).

Responsiveness (or sensitivity) refers to the ability of an instrument to detect relevant changes in outcome measures even when this change is very small (Guyatt et al., 1987). The optimal method for examining responsiveness is to conduct randomised controlled trials and directly comparing the ratings obtained from the different response formats for improvements in the outcome measures. VAS are widely considered to be capable of detecting of very small changes in outcome measures, and as such are regarded as highly responsive (e.g., Gift, 1989; Tibbling, 1981).

Despite the intuitive appeal of LS and VAS differing in terms of data equivalence, reproducibility, and responsiveness there is a striking paucity of direct comparisons between LS and VAS within the literature to support these claims. A comprehensive search of the literature revealed only 10 studies directly comparing LS and VAS (Bellamy et al., 1999a, 1999b; Brunier & Graydon, 1996; Grant, Aitchison, Henderson, Christie, Zare, McMurray, & Dargie 1999; Guyatt et al., 1987; Jaeschke et al., 1990; Joyce et al., 1975; Murphy et al., 1988; Nyren et al., 1987; Pfennings, Cohen & van der Ploeg, 1995).

Significant positive correlations for ratings of acute pain were reported for 10-point LS and 10 cm VAS (Murphy et al., 1988), and ratings of fatigue using 5-point LS and 10 cm VAS (Brunier & Graydon, 1996). Studies have reported that self-ratings of pain intensity are rated higher with 10-point LS than with 10 cm VAS (Murphy et al., 1988); conversely, VAS ratings obtained for the perceived blackness of squares were rated higher than perceptions obtained from graduated LS (Neely & Borg, 1995). Furthermore, research conducted by Pfennings et al. (1995) reported significantly more variability in 10 cm VAS responses to a general health questionnaire,
Comparison of Likert compared to measurements using 10-point LS. Previous research has also reported that VAS of varying length possessed both ceiling and floor effects for measurements of subjective phenomena (Gift, 1989; Neely & Borg, 1995; Neely, Ljunggren, Sylven & Borg, 1992). However, Murphy et al. (1988) reported no ceiling or floor effects for either 10-point LS or 10 cm VAS for self-ratings of acute pain.

Nyren et al. (1987) reported that 7-point LS demonstrated greater reproducibility than 10 cm VAS for self-ratings of abdominal pain; however, 10 cm VAS were reported to be more reproducible than 5-point LS for assessments of breathlessness and general fatigue after exercise (Grant et al., 1999).

Direct comparisons between LS and VAS have demonstrated no significant differences in responsiveness for ratings of chronic pain (Guyatt, et al, 1987; Nyren, et al., 1987), or breathlessness in patients surviving chronic heart failure (Jaeschke et al., 1990). However, other studies have demonstrated that 10 cm VAS possessed superior responsiveness above 4-point LS for self-ratings of arthritic and chronic pain (Bellamy et al., 1999a, 1999b; Joyce et al., 1975).

The above research indicates that LS and VAS may differ across a number of properties, which are important for the development, evaluation, and practical application of psychosocial interventions. However, the majority of the direct comparisons investigated differences between response formats for subjective assessments of pain or fatigue. It is not clear from the literature if LS or VAS would yield equivalent data for the measurement of coping variables. To the knowledge of the present study authors, there has been no published data comparing the performance of different response formats for the measurement of coping variables. Therefore, the current study aimed to compare the performance of two different response formats (LS and VAS) for the assessment of transactionally defined functional coping.
Functional coping describes what an individual believes a coping style (or styles) will achieve for them psychologically (Ferguson & Cox, 1997); for example, an individual may cry (style of emotional release) holding the belief this will alleviate emotional distress (function). It has been argued that the validity and reliability of coping assessments are confounded by subjective evaluations of functional coping by researchers using structural frameworks (Cox & Ferguson, 1991; Dewe, Cox & Ferguson, 1993; Flynn, van Schaik, van Wersch & Kelly, 2002; Jalowiec, Murphy & Powers, 1984). Inferred function from structure is seriously limited, and cannot be regarded as a valid reflection of why individuals themselves used particular styles of coping (Dewe et al. 1993; Ferguson & Cox, 1997).

In response to this methodological shortcoming of structural assessments of coping, Ferguson and Cox (1997) developed the 16-item Functional Dimensions of Coping Scale (FDC). The FDC was developed on the premise that a more valid and reliable approach to the assessment of coping was to enable individuals themselves to define what function their coping style(s) performed (see Ferguson & Cox, 1997). Functional coping within the FDC framework is self-defined across four dimensions; approach (behaviours related to direct problem-solving), emotional regulation (dealing with the emotional conditions created by stressors), reappraisal (behaviours enabling a reinterpretation of a stressors meaning to enable a solution to be found), and avoidance (behaviours that enable individuals to deny a problems existence). Research has demonstrated the reliability and validity of the FDC for the transactional assessment of coping within student populations (see Ferguson & Cox, 1997; Flynn et al., 2002). Therefore, the aim of the current study was to compare 7-point LS with 65 mm VAS, in order to determine if different response formats yield equivalent data for transactionally defined functional coping.
MATERIALS and METHODS

Participants

A volunteer sample of 112 undergraduate and postgraduate psychology students (26 males and 78 females; mean age = 25.07 years, SD = 7.42). Eight participants failed to specify their gender, 12 failed to specify their age, and 10 failed to complete a VAS. All participants were treated in accordance with the “Ethical Principles of Psychologists and Code of Conduct” (American Psychological Association, 1992).

Materials

The instruments used for this study consisted of the 16-item FDC Scale developed by Ferguson and Cox (1997), 7-point LS, and 65 mm VAS (see figure 1). In addition, a transparent marking sheet was used for converting VAS responses into LS graduations.

Design and Procedure

A within subjects design was used to compare the data equivalence of LS and VAS for the assessment of transactionally defined coping function (i.e., approach, emotional regulation, reappraisal and avoidance). The procedure for the assessment of functional coping within the FDC framework adhered to the methodology described by Ferguson and Cox (1997, p. 114). This required participants to complete a two-stage task prior to the presentation of the FDC, which employed two free-response questions. The first question asked the participants to describe four stressful life events (stressors), which they had experienced in the previous three months of the study. Secondly, participants were asked to describe the coping styles (behaviours,
emotions or cognitions) they used to deal with each of the stressors. Each participant was then asked to rate one of the four stressors as their most stressful event (i.e., caused them the most anguish or emotional difficulty). Coping activities were content analysed and coded into 1 of 21 coping styles described by Ferguson and Cox (1997). Each participant was assigned a primary coping style (i.e., the most heavily emphasised coping activities that corresponded to a distinct coping style). In order to determine the accuracy reliability (Krippendorf, 1980) of the coding procedures for stressors and coping styles an independent rater was trained in the use of the coding procedures. Inter-rater reliabilities were then calculated between the first author (DF) and the trained rater.

Participants were then presented with two separate versions of the FDC. The responses for the 16-items of the first version of the FDC were framed as a series of 7-point LS, anchored with the descriptive phrases not at all and very much so. Intermediate graduations upon the LS were labelled with numbers (0, 1, 2, 3, 4, 5, & 6). The second version of the FDC used identical wording for the 16-items, except the responses were framed as a series of 65 mm VAS (anchored with not at all at the left and very much so at the right). The stem question, “to what extent did these coping activities of your most stressful event”, preceded each item in both versions of the FDC. The presentation of the two versions was counterbalanced to control for order effects. In response to the stem question participants circled or crossed their scores for the LS, and placed a mark along the horizontal line for the VAS (see figure 1).

The scores obtained from the LS version of the FDC were recorded in a standard numerical format (0 through to 6). The scores obtained from VAS were transformed into LS graduations (i.e., 0 through to 6), for the purposes of comparison. This was achieved by dividing the 65 mm horizontal line into seven equal intervals, with the markings read to the closest integer. This
methodological procedure was described and successfully used by Nyren et al. (1987, p. 410). In order to transform the VAS scores into whole integers, a transparent sheet with marked graduations (as described above) was placed over each VAS response sheet (See figure 2 for an example of this procedure).

The example shown in figure 2 was scored as 1, as the mark along the VAS corresponded to the integer one. This procedure was carried out for each FDC item proceeded by a VAS, for the 102 participants who completed a VAS. The authors of the present study defended the omission of fractions as a valid procedure for comparative purposes, as LS do not allow fractionated responses to be given (see Nyren et al., 1987). None of the participants received any training in the use of the LS or VAS. In order to avoid confusion, the term response format is hereafter replaced with the term response condition with two levels: LS and VAS.

Arguably, this procedure may have limited the comparability of the data as the majority of previous research directly comparing VAS with LS either, (a) scored VAS as 100-point scales, (b) transformed the VAS data using statistical techniques (e.g., arc sin transformation) or (c) used single item VAS. The authors of the present study defend the procedure described here, based on the following three considerations. Firstly, arc sin transformation was not used as statisticians are divided on the utility of this approach for the purposes of data comparison (Murphy et al., 1988). Secondly, the meaningfulness of 100 categories is seriously diminished, given that research has demonstrated that individuals can only efficiently discriminate between a maximum of seven categories when processing sensory information (see Wolff, 1980). Thirdly,
treated VAS as a graduated scale facilitates the relative ease the data can be interpreted by clinicians and researchers.

RESULTS

The results are reported in three sub-sections; (a) psychometric properties, (b) levels of functional coping and (c) patterns of association between coping style and function. Participants who failed to complete a VAS were omitted from analyses (n = 10).

Psychometric Properties

The results from principle axis factor analyses largely confirmed the four-component structure of the FDC in both response conditions as reported by Ferguson and Cox (1997. p.119). However, for both response conditions the item reappraisal five demonstrated a cross loading upon the approach component (see table 1). The VAS condition explained a slightly greater amount of the total variance than the LS condition (64% and 61% respectively). Although, principle axis factor analysis does not allow the statistical testing of differences, explained variance per subscale differed according to response condition: Approach (VAS > LS), Emotion (VAS > LS), Reappraisal (LS > VAS), and Avoidance (LS > VAS).

The Cronbach’s alpha values, means, standard deviations, and subscale correlations in both response conditions are presented in table 2. The four FDC subscales reported excellent internal reliability for both response conditions with marginally larger alpha values in the VAS condition.

The four FDC subscales were summed and correlated with each other. The FDC in both response conditions demonstrated excellent internal validity with identical pattern of significant
positive and negative associations between all four FDC subscales. In both response conditions, emotion and reappraisal were not significantly associated with avoidance, which was expected as: (a) a coping behaviour could not allow the avoidance and reappraisal of a stressor simultaneously (Ferguson & Cox, 1997), and (b) avoiding a stressor enables a person to simultaneously deny anything is wrong and repress any associated emotion. Consistent with previous research, approach and avoidance were negatively correlated in the VAS condition and not associated in the LS condition, “as it would have been inconceivable to ascribe a behaviour as simultaneously performing both an approach and avoidance function” (Ferguson & Cox, 1997, p. 119). The remaining coefficients were all positively associated and high scores represented a greater probability of a high score on an additional coping function. Correlations between all four corresponding subscales in the two response format conditions revealed significant positive relationships with each other; furthermore, the patterns of association between response formats for individual subscales were identical to the patterns of association within each response condition described above (see table 3).

Levels of Functional Coping

An inspection of the means for each FDC subscale in both response conditions, revealed that participants tended to rate functional coping higher within the Likert condition, and lower in the VAS response condition (see table 4 and figure 3). However, coping profiles in terms of the rank order of subscale scores were identical within both response conditions: emotion > approach >
significant interaction effect between response format and FDC subscale was reported. This confirmed that participants were significantly more likely to rate the perceived function of their coping higher within the LS condition.

A two-way repeated measures ANOVA revealed a significant main effect of response format ($F_{(1,101)} = 37.48, p < 0.001$, $MS_{\text{response format}} = 16.09$) and FDC subscale ($F_{(2,20, 221.67)} = 25.03, p < 0.001$, $MS_{\text{FDC subscale}} = 114.56$, Greenhouse-Geisser correction applied). No significant interaction effect between response format and FDC subscale was reported. This confirmed that participants were significantly more likely to rate the perceived function of their coping higher within the LS condition.

Association Between Coping Function and Coping style

Coping styles with $\geq 5$ data points were used in eight stepwise regression analyses. Coping styles with $< 5$ data points were unlikely to possess adequate statistical power (Cohen, 1988). Four stepwise regression analyses revealed that each coping function was associated with one, two, or three coping styles for the LS response condition (see table 5). Approach was positively associated with direct action and situational redefinition. Emotional regulation was negatively associated with emotional release. The reappraisal function was negatively associated with instrumental social support and emotional release. Avoidance was positively associated with denial and optimism, and negatively associated with emotional release.

Four more stepwise regression analyses revealed a different pattern of association between coping styles and functions for the VAS condition (see table 5). Approach was positively associated with direct action and situational redefinition; reappraisal was negatively associated
with denial, instrumental social support and emotional release. Avoidance was positively
associated with denial and optimism. Emotional regulation was not significantly associated with
any coping style in the VAS condition.

DISCUSSION

Considerable work has gone into examining the most efficacious method of presenting
individual response formats, such as the most efficient number of intermediate points on LS
(Jaeschke et al., 1990; Guyatt et al., 1987). Conversely, an extremely limited number of studies
have directly compared differences between response formats and their selection based on
properties such as data equivalence. The current study addressed the data equivalence of multi-
item 7-point LS and 65 mm VAS for the measurement of functional coping within the FDC
framework. Both versions of the FDC yielded equivalent psychometric properties consistent with
previous research (see Ferguson & Cox, 1997).

However, participants in the current study responded differently to the FDC as a function of
response format, with all four FDC subscales rated higher within the LS condition. This finding
was consistent with previous research that reported LS yielded significantly higher baseline
assessments of subjective states than VAS (Murphy et al., 1988). The use of multi-item VAS and
LS for the measurement of subjective phenomena has reported a degree of response bias, with
participants favouring mid-point responses (Gift, 1989). However, the current study
demonstrated no response bias in terms of neutral responses for either response format.
The patterns of association between style and function reported in the current study did not correspond with previous research (Ferguson & Cox, 1997 p.123). In the LS version the approach function was transactionally (i.e., self-defined) defined by an increased likelihood of actively seeking a resolution to a stressor (direct action) and evaluating the situation from a different angle and looking at the positive aspects of a situation (situational redefinition). Emotional regulation was defined by not venting anger or emotions (emotional release). Reappraisal was defined by an increased likelihood of not seeking expert advice (instrumental social support) or engaging in emotional release. The avoidance function was defined by refusing to acknowledge a situation was real (denial), believing everything would work out positively in the future (optimism), and not venting emotions (emotional release).

However, for the VAS version of the FDC the patterns of transactionally defined functional coping were different to the LS version for all four coping function subscales: (a) emotional regulation was not significantly associated with any coping style, (b) reappraisal was negatively associated with an additional coping style of denial, and (c) avoidance was no longer negatively associated with emotional release. Therefore, the two response formats did not capture subjective functional coping in quite the same way.

A possible explanation may have been that in the LS condition participants were forced to choose the closest numerical approximation (after considering the meaning of the anchors) most representative of the perceived function of their coping, and within the VAS condition participants may have rated the general magnitude of their coping in relation to the line length without necessarily considering the meaning of the anchors or the intermediate points (Duncan et al., 1989). Participants in the current study may have over and under-estimated the perceived function of their coping in the LS and VAS response conditions respectively, which resulted in
higher average scores in the LS condition and different patterns of transactionally defined coping function between the two versions of the FDC.

Despite the intuitive appeal of this explanation the results of the current study could not confirm these assertions, as it was not clear whether participants perceived the two response formats in this way. The greater number of associations (construct validity) between coping function and coping style for the LS version suggested this response format captured a greater range of transactionally defined functional coping; however, the VAS version captured a greater number of relationships for the reappraisal function. Consequently, based on the results of the current study LS and VAS do not yield equivalent data for transactionally defined coping function.

The differences in transactional coping patterns between the LS and VAS may appear small; however, in clinical contexts these differences may be very important for the management of psychosocial distress (complemented by other clinical information gained from other sources such as clinical interviews) in order to recommend a treatment approach that is matched to a respondent’s unique coping status. Differences between the two response formats in the coping function of emotional regulation is particularly important for clinical decision-making, as emotion-focused coping is associated with negative health states such as mental health problems (Parkes, 1990), depression (Endler & Parker, 1990), and dysphoria (Moeller, Richards, Hooker & Ursino, 1992). Consequently, the reliance upon baseline data from VAS as opposed to LS in clinical contexts (or vice-versa) for variable measurement may have inadvertently contributed to different treatment options being initiated, considered or even terminated based on responses to instruments such as the FDC.
The multiple VAS used in the present study were scored as 16 separate 7-point graduated scales, by dividing the 65 mm line into seven equal intervals for comparative purposes. Previous research recommended the use of LS on the basis that a change in one point upon a LS can be more readily interpreted than a 10 mm change on a VAS (Guyatt et al., 1987). However, as demonstrated in the current study data from VAS can easily and quickly transformed into discrete categories for determining the degree of change that is representative of a significant shift in clinical status (Guyatt et al., 1987) by transposing a grid over the VAS items that greatly facilitated the scoring, interpretation, and analysis of the VAS data. Furthermore, scoring both LS and VAS as 7-point graduated scales may also stabilise the relative reproducibility between the two response formats.

A potential limitation of the present study was that no training was administered in the use of either response format. Consequently, the reliable and valid use of the response formats (especially the VAS) was not completely satisfied in the current study. Furthermore, individual differences such as gender, age, and intellectual abilities may have confounded the results of the current study. Gender is consistently reported as a mediating factor in the expression of coping, with females relying more upon emotion-focused coping and males more upon approach-focused coping (e.g., Avero & Calvo, 1999; Lutzky & Knight, 1994). Gender differences in responses to subjective phenomena have also been demonstrated to differ as a function of response format (Brunier & Graydon, 1996). Previous research has also reported that VAS required a significant amount of visual, motor co-ordination, and concentration from participants (Murphy et al., 1988); therefore, VAS may be inappropriate for use with older adults or people with disabilities. Finally, the relative ease of completing either response format may have been largely dependent upon participants' aptitude for numerical rating or visuo-spatial tasks (Duncan et al., 1989).
The current study evaluated the data equivalence of LS and VAS in terms of baseline differences in the assessment of functional coping; however, it is not clear which response format would yield superior responsiveness or reproducibility. Future work is warranted to evaluate the responsiveness and reproducibility of LS and VAS within randomised-controlled trials (RCT) employing interventions of known benefit for psychosocial stress. RCTs are only ethical where it is known that an intervention would do more harm than good (Guyatt et al., 1987); this consideration prohibited the evaluation of responsiveness and reproducibility in the current study. Furthermore, different lengths of VAS (65mm versus 100mm) and numbers of LS categories should be investigated to determine the most efficacious method of presenting different response formats for the assessment of coping variables. Moreover, further research is needed to ascertain if VAS and LS would yield different scale properties for other coping variables and inventories (Jaeschke et al., 1990). Finally, how respondents perceive different response formats as a function of gender, age, physical, and intellectual ability also need to be evaluated qualitatively to add depth to quantitative assessments.

The literature on stress and coping is littered with potentially confounding methodological weaknesses, such as the utilisation of assessment tools with questionable reliability, validity, and inconsistent factor structures (see MacFarlane & Sony, 1992; Parker, Endler & Bagby, 1993; Tomaka, Blascovich, Kelsey & Leitten, 1993). The current study demonstrated that a further confounding factor in stress and coping research may be the response format selected for variable measurement, which could potentially lead to classic research errors (type I or type II) being made from inappropriate methods of data collection (Joyce et al., 1975).

In conclusion, the current study provided several contributions to the literature. Firstly, it clearly demonstrated that measurements obtained from LS and VAS, even when assessing the
same subjective phenomenon on the same occasion do not produce equivalent data from the
same population. Secondly, it was demonstrated that VAS can be easily and quickly transformed
into discrete categories that (a) are more readily grasped and interpretable by clinicians with a
negligible amount of extra work required for analysis, and (b) enable meaningful comparisons
between discrete and continuous response formats to be made. Finally, based on the results of the
current study it is concluded that within the FDC framework, baseline assessments of coping
utilising LS capture a greater range of transactionally defined functional coping than VAS.
REFERENCES


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### Table 1

**Principle Axis Factor Analyses for Each of the 16 FDC Items in both Response Conditions**

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<td></td>
<td></td>
</tr>
<tr>
<td>Avoid. 3</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Avoid. 4</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of variance</td>
<td>17.84</td>
<td>14.88</td>
<td>14.59</td>
<td>13.65</td>
<td>19.79</td>
<td>17.16</td>
<td>13.65</td>
<td>13.52</td>
</tr>
<tr>
<td>Cumulative %</td>
<td>17.84</td>
<td>32.72</td>
<td>47.31</td>
<td>60.96</td>
<td>19.79</td>
<td>36.95</td>
<td>50.60</td>
<td>64.12</td>
</tr>
</tbody>
</table>

*Note.* Rotation method: Varimax with Kaiser Normalisation  
\(^a\) Cross loading
Table 2

Alpha Coefficients (on the diagonal) and Inter-correlations for the Four FDC Subscales in Both Response Conditions

<table>
<thead>
<tr>
<th>FDC Subscale</th>
<th>Approach</th>
<th>Emotion</th>
<th>Reappraisal</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion</td>
<td>.42**</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>.56**</td>
<td>.32**</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>-.15</td>
<td>.12</td>
<td>.01</td>
<td>.83</td>
</tr>
</tbody>
</table>

** Likert Scale  

<table>
<thead>
<tr>
<th>FDC Subscale</th>
<th>Approach</th>
<th>Emotion</th>
<th>Reappraisal</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotion</td>
<td>.42**</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td>.61**</td>
<td>.36**</td>
<td>.82</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>-.22*</td>
<td>.11</td>
<td>-.03</td>
<td>.88</td>
</tr>
</tbody>
</table>

*p < .05.  **p < .01.
Table 3

Correlation Matrix of the Association Between the FDC Subscales in Both Response Conditions

<table>
<thead>
<tr>
<th>FDC Subscale</th>
<th>Approach</th>
<th>Emotion</th>
<th>Reappraisal</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VAS</td>
<td>VAS</td>
<td>VAS</td>
<td>VAS</td>
</tr>
<tr>
<td>Approach LS</td>
<td>.91**</td>
<td>.35**</td>
<td>.60**</td>
<td>-12</td>
</tr>
<tr>
<td>Emotion LS</td>
<td>.47**</td>
<td>.76**</td>
<td>.31**</td>
<td>.10</td>
</tr>
<tr>
<td>Reappraisal LS</td>
<td>.55**</td>
<td>.27**</td>
<td>.86**</td>
<td>-.01</td>
</tr>
<tr>
<td>Avoidance LS</td>
<td>-.22*</td>
<td>.11</td>
<td>-.05</td>
<td>.90**</td>
</tr>
</tbody>
</table>

*p < .05.  **p < .01.
Table 4

Means, Standard Deviations, Kurtosis Statistic and Standard Error of Kurtosis for each FDC Subscale in Both Response Conditions

<table>
<thead>
<tr>
<th>FDC Sub-Scale</th>
<th>Likert Scale N = 102</th>
<th>VAS N = 102</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Approach (4)</td>
<td>3.29</td>
<td>1.50</td>
</tr>
<tr>
<td>Emotion (3)</td>
<td>3.63</td>
<td>1.43</td>
</tr>
<tr>
<td>Reappraisal (5)</td>
<td>3.10</td>
<td>1.46</td>
</tr>
<tr>
<td>Avoidance (4)</td>
<td>2.07</td>
<td>1.57</td>
</tr>
<tr>
<td>Overall (16)</td>
<td>3.02</td>
<td>0.95</td>
</tr>
</tbody>
</table>

*Number of scale items
Table 5

The relationship between coping function and coping style (N=102)

<table>
<thead>
<tr>
<th>Coping Style</th>
<th>Approach</th>
<th>Emotion</th>
<th>Reappraisal</th>
<th>Avoidance</th>
<th>Approach</th>
<th>Emotion</th>
<th>Reappraisal</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denial</td>
<td>+.38**</td>
<td>-</td>
<td>-.25**</td>
<td>+.42**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct action</td>
<td>+.32**</td>
<td></td>
<td>+.33**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional release</td>
<td>-.25*</td>
<td>-.23*</td>
<td>-.18*</td>
<td>-</td>
<td>-.26**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional social support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental social support</td>
<td>-.21*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.23*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimism</td>
<td></td>
<td></td>
<td>+.22*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+.19*</td>
</tr>
<tr>
<td>Situational redefinition</td>
<td>+.24**</td>
<td>+.24*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R²</td>
<td>.14</td>
<td>.06</td>
<td>.09</td>
<td>.23</td>
<td>.15</td>
<td>.16</td>
<td>.21</td>
</tr>
</tbody>
</table>

Note. Figures are standardised β values  * p < 0.05    ** p < 0.01
Figure Captions

Figure 1. Examples of the seven-point LS and 65-mm VAS used for the study.

Figure 2. Example of the procedure used for transforming VAS responses into interval data.

Figure 3. Functional coping level as a function of response format.
<table>
<thead>
<tr>
<th>Not at all</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Very much so (LS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very much so (VAS)</td>
</tr>
</tbody>
</table>
Not at all | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Very much so

- X -