Development of a Scale for Repeated Measures of Mood State

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Introduction

A future study on workload and fatigue of Royal Australian Navy (RAN) Combat System Operators (CSOs) will require repeated measures of instantaneous mood state (affect) during ongoing task performance.

Single item measures minimise intrusiveness and task interference but can have low reliability. Anchors need to be carefully chosen to be relevant to the target population and task context.

Valence and activation are often considered the major underlying dimensions of mood state, which can be rotated through approximately 45 degrees to achieve the dimensions of Positive Affect (PA) and Negative Affect (NA) (Russell, 1980; Watson & Tellegen, 1985) (see Figure 1). For descriptive purposes the choice of axes is largely one of convenience. As many of the adjectives used to assess mood appear to align with the PA / NA rotation this will be used for the current scale development.
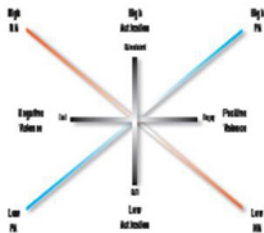

Figure 1. Different conceptualisations of the major affect dimensions

Single-item scales for PA and NA need to be bipolar (range from low through neutral to high) rather than unipolar (range from neutral to high). Bipolar scales are potentially more difficult to develop as the anchors need to truly be the opposites of a single dimension (Russell & Carroll, 1999; Watson & Tellegen, 1999), but they avoid the ambiguity inherent in unipolar scales as to how the neutral anchor is interpreted.

Aim

To identify appropriate anchors for single-item bipolar scales of positive affect and negative affect to measure the instantaneous mood states experienced by RAN CSOs while conducting warfighting duties.

Method

89 RAN CSOs with recent experience completed a questionnaire that asked them to rate 33 mood adjectives according to:

1. How frequently they experienced each mood when conducting their warfighting duties
   (0 = never, 10 = always)

2. How pleasant it was for them to experience the mood (-5 = extremely unpleasant, 5 = extremely pleasant).

3. How activated they felt when experiencing that mood (-5 = extremely deactivated, 5 = extremely activated).

The adjectives were taken from the:

Positive and Negative Affect Schedule (PANAS)

UWIST Mood Adjective Checklist (UMACL)

Fatigue subscale of the Profile of Mood States (POMS)

Results

Rated Frequency, Valence and Activation

Ratings were converted to z scores and the frequency results are shown in Figure 2.

Low PA was the most frequently experienced mood dimension. This is consistent with anecdotal reports that CSOs commonly experience fatigue when performing their duties.

Somewhat surprisingly, high NA was the least frequently experienced dimension. This may reflect a lack of warfare exposure or evidence that CSOs are sufficiently well trained to deal with such challenges.
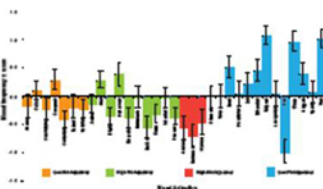

Figure 2. Z score of how frequently RAN CSOs experience 33 mood states when conducting warfighting duties. Error bars represent the 95th percentile confidence interval

A scatter plot of the mean valence and activation z score of each adjective is shown in Figure 3. As expected, the high PA and low PA adjectives cluster in the upper right and lower left quadrants of the affect space respectively.

The position of the NA adjectives, however, were not as expected. They appear to form a largely bipolar axis, but oriented has a far smaller rotation from the axes than the expected 90 degrees.
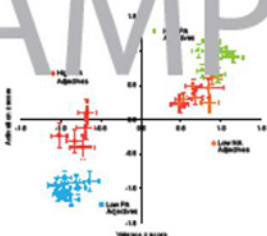

Figure 3. Scatter plot of the mean valence and activation z score of each mood adjective. The error bars represent the 95th percentile confidence interval.

This result may be due to pleasant deactivated mood states not being common in the work context being examined. In work settings, low NA terms (e.g. calm, composed) may correspond to moderate levels of task demand (and thus activation) which is being effectively managed rather than low activation levels that might be experienced during leisure time. Also, as participants experience high NA relatively infrequently (see Figure 2) they may also experience it with relatively low intensity.

However, as there were large individual differences in the activation ratings for the NA adjectives, the result may also be due to participants having difficulty in interpreting the activation question in the questionnaire.

Selection of Anchors for PA and NA Scales

Figure 2 shows that two or three adjectives in each dimension were experienced with substantially higher frequency than the others, making them potentially appropriate anchors.

These were:

	Low	High
PA	Tired, Fatigued, Sleepy	Alert, Determined
NA	Calm, Composed	Stressed, Tense

An additional consideration in anchor selection is the extent to which they are bipolar. Truly bipolar anchors are equidistant from the origin and lines drawn from the origin to the coordinate of each anchor subtend an angle of 180 degrees. Figure 4 shows the angle and distance bipolarity error for each of the above PA and NA anchor combinations.
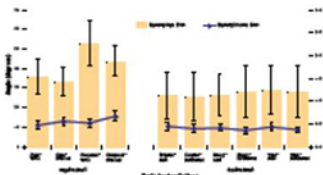

Figure 4. The extent to which scales formed by various PA and NA anchor adjectives differ from true bipolarity in terms of angular separation and distance from origin. Error bars represent the 95th percentile confidence interval.

Figure 4 suggests that, within individuals, NA scales formed with "composed" as the low anchor may be less bipolar than if "calm" was used as the low anchor. No other clear patterns emerge.

In the absence of additional data two main options appear to exist for anchor selection. One is to use more than one anchor for each scale. However, this may introduce uncertainty as to just what is being measured, and not all same-scale anchors exhibited high correlation.

Alternatively judgement could be used to select individual anchors for each scale. "Tense" may be preferred over "stressed" on the on the basis that it is a potentially purer affect term. "Alert" could be preferred over "determined" as it has less motivational overtones. Of the three low PA anchors, "sleepy" does not appear to be a particularly task orientated affect term and "tired" is potentially more sensitive than "fatigued" to the effects of task demands over the period of typical experimental sessions (Grech, 2009).

Conclusion

In the context of Royal Australian Navy Combat System Operators performing warfighting duties, a subset of 9 mood adjectives were identified as being experienced substantially more frequently than others typically used in mood questionnaires. This makes them potentially suitable anchors for scales of PA and NA specific to the population and task under study.

However, the data does not support a clear choice of the best single adjective to use for each mood dimension.

References

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