

The Scale of Emotional Arousability: bridging the gap between the neuroticism construct and its measurement

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SYNOPSIS This paper outlines and evaluates a newly developed measure of neuroticism, the Scale of Emotional Arousability (SEA). The 15-item scale is economical to use, avoids the consistent pattern of negatively worded items that plagues the neuroticism (N) Scale of the Eysenck Personality Inventory (EPI) and comprises of items that focus specifically on emotional arousability, thereby bringing the measurement of neuroticism in line with Eysenck's (1967) original conceptualization. The SEA shows every indication of being psychometrically sound and correlates with related constructs in much the same way as the N Scale of the EPI. The SEA is recommended as an alternative to the EPI for research purposes, particularly where there is a need to measure independently such related constructs as neurosis, self-esteem and private self-consciousness.

INTRODUCTION

As data accumulate on the relations between life events, social support, coping mechanisms and neurotic illness, research workers have turned their attention to a fourth risk factor—personality (Costa & McCrae, 1980*a*; Henderson *et al.* 1981; Kobasa, 1979). Personality traits, types or temperaments are enduring predispositions of the individual to respond to the environment in certain predictable ways. Such concepts are complementary to the environmental stressors, environmental buffers and coping behaviours that have traditionally been measured in causal models seeking to explain neurotic illness. Eysenck's well-known and widely accepted concept of neuroticism (Eysenck & Eysenck, 1969) has been one of the most popular personality factors to be singled out for investigation (Henderson *et al.* 1981; Martin, 1985). Eysenck (1967) concurs with Jones (1960) that neuroticism is essentially vulnerability to neurosis, involving a low tolerance for stress, be it physical or psychological. As such, its

relevance to life event research is unquestionable. The issue of its measurement, however, is more contentious.

CRITIQUE OF EYSENCK'S N SCALE

The most widely used procedure for measuring neuroticism has been to administer Eysenck's self-completion neuroticism (N) Scale or some variant thereof. While widespread support undoubtedly remains for Cline's assessment of the Eysenck Personality Inventory (EPI) as 'the best instrument now available' (Cline, 1972, p. 163), the EPI has not been without its critics.

One of the major reservations voiced in the literature relates to the appropriateness of the items selected to represent the neuroticism domain. Most attention has focused on the match, or rather the mismatch, between the conceptualization and measurement of the neuroticism construct. Eysenck defines neuroticism as emotional sensitivity or over-responsiveness: 'Emotionality, neuroticism, or anxiety, conceived of as personality variables, are descriptive concepts which refer to a greater emotional arousability of certain people, as compared with others' (Eysenck, 1967, p. 52). Tellegen (1978) has noted, however, that there is

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'no simple correspondence... between the N concept and the N scale content' (Tellegen, 1978, p. 802). A considerable proportion of the items in the N Scale refer, not to emotionality *per se*, but to the unpleasant experiences that are contingent upon being emotionally aroused – for example, making up your mind too late, having trouble sleeping. Other items are even less closely associated with emotionality. On the basis of such questions as 'Do you often think of your past?', Buss & Plomin (1975) express concern about the precise meaning of neuroticism.

Finding that seemingly unrelated items such as the above correlate with measures of emotional arousability does not provide scientific justification for assuming that they all measure neuroticism. These items may tap other related constructs. If such related constructs cannot be distinguished empirically from the core neuroticism construct, a new conceptualization and definition of neuroticism needs to be developed to incorporate the new components. This option seems to be favoured by Costa & McCrae: 'Neuroticism, as we use that term, is a broad dimension of normal personality that encompasses a variety of specific traits, including self-consciousness, inability to inhibit cravings, and vulnerability to stress as well as the tendency to experience anxiety, hostility, and depression' (Costa & McCrae, 1985, p. 21). The alternative approach is to support Eysenck's (1967) more focused definition, to measure the construct in accordance with this definition and try to differentiate neuroticism clearly from related constructs. This is the option guiding the current research.

Apart from the empirical realities of construct measurement, a theoretical consideration warns against broadening the definition of neuroticism too readily. Favouring such an option would have serious implications for related constructs such as neurotic illness. The use of the N Scale in models seeking to predict neurotic illness has already been mentioned. On close examination of the N Scale and such well-known measures of neurosis as the General Health Questionnaire (GHQ) (Goldberg, 1972) and the anxiety and depression scales from the Delusions-Symptoms-States Inventory (DSSI/sAD) (Bedford *et al.* 1976), considerable overlap in the content of items becomes apparent. Such behaviours as

'sleeplessness through worry', 'poor concentration' and 'feeling down' appear both as neurotic symptoms and as manifestations of trait neuroticism. Admittedly, there is a difference in the time frame specified in the instructions. State measures refer to the past few weeks, while trait measures require respondents to report how they generally are. Test-retest reliability coefficients indicate that, on balance, respondents do differentiate between current states and general traits (Goodchild & Duncan-Jones, 1985; Henderson *et al.* 1981; Spielberger *et al.* 1970). Such discriminations, however, are bound to elude some respondents, particularly when the instruments are self-administered, resulting in inflation of the expected positive correlation between trait and state when presently available measures are used. An instrument which more adequately matches Eysenck's (1967) conceptualization of neuroticism as emotional over-responsiveness, and excludes forms of behaviour which are consequences of such a predisposition, will avoid the overlap in item content of the N Scale and measures of neurosis.

A further criticism to be levelled at Eysenck's N Scale relates to response biases. First, the instrument has no safeguard against an acquiescence response set (Jackson & Messick, 1958; Scott, 1968). A 'yes' response is consistently used to infer the presence of trait neuroticism, even though such a response may have its origins in a tendency to agree with whatever is said. Eysenck & Eysenck (1964) acknowledge this problem, but maintain that acquiescence bias plays only a small and unimportant role. The problem is less inconsequential, however, when the N Scale is used to predict scores on other instruments open to the same response bias such as the DSSI/sAD. Once again, artifactual positive correlations can arise between the trait and state indices.

A second well-known response set, social desirability (Edwards, 1957), poses similar problems for EPI users. As with acquiescence bias, Eysenck & Eysenck (1964) claim that social desirability does not play an important part, though they acknowledge that considerable falsification occurs when the EPI is used for selection purposes. Studies focusing on psychiatric morbidity may be sufficiently threatening to create a climate in which distortion of the self is seen as defensible by a significant proportion of

respondents. If this response tendency were followed on both the N Scale and on symptom measures, a somewhat inflated positive correlation would be expected. Clearly, there is a need for a personality instrument which is not dominated by experiences that are so negatively valued within the culture. Too transparent an instrument will invite manipulation either to deceive others or to protect oneself.

In summary, while the N Scale undoubtedly taps the neuroticism trait, other characteristics of the individual are also measured. The N Scale measures behavioural and physiological characteristics that cannot be derived logically from Eysenck's (1967) definition of neuroticism, characteristics that are consequences of emotional arousability, commonly regarded as symptoms and included in state measures of neurosis. Furthermore, under certain conditions, the N Scale can also measure a willingness to agree and a readiness to present oneself in a socially desirable light. Thus, correlations of Eysenck & Eysenck's (1964) N Scale with state measures of anxiety and depression may be elevated by factors other than emotional over-responsiveness.

MEASURING THE TRAIT OF EMOTIONAL OVER-RESPONSIVENESS

The point of departure for developing an alternative measure of neuroticism was Buss & Plomin's (1975) EASI-III Temperament Survey. In an earlier study (Braithwaite *et al.* 1984), the survey proved to be a particularly attractive means of measuring personality. The items are characterized by simple and modern language and were derived from a clearly articulated sampling frame. Buss & Plomin defined temperament as broad stable personality dispositions, largely inherited, which described the manner or style in which individuals acted out their roles. Of the four styles postulated – emotionality, activity, sociability and impulsivity – the first and the last have relevance to developing a new measure of neuroticism.

Buss & Plomin (1975) used emotionality to refer to the negative emotions aroused by threatening or noxious stimuli. Emotionality implies easy arousability, frequent reactivity and high responsiveness. In other words, a highly emotional person has a lower threshold for

experiencing distress, will experience it more often and with greater intensity than an unemotional person. Buss & Plomin delineated three inter-related components to their emotionality temperament. Global feelings of distress are represented by the general emotionality component. The remaining two represent more specific reactions to threat, namely anger and timidity. In addition to these components, a fourth is added from the impulsivity domain – inability to resist cravings. Although Buss & Plomin regarded impulsivity as a separate temperament, previous work (Braithwaite *et al.* 1984) suggests that impulsivity is a multidimensional construct. Some components reflect a sociable active personality while others reflect an inability to control emotional reactions. The latter have been shown to have empirical ties to the emotionality component. General emotionality, anger, fear and lack of emotional control were found to define a higher order emotional arousability dimension (Braithwaite *et al.* 1984). Inability to control one's feelings is conceptually compatible with the notion of neuroticism as emotional over-responsiveness. To borrow Buss & Plomin's analogy, impulsivity represents 'the brakes (or lack of brakes)', while emotionality represents 'the engine' (Buss & Plomin, 1975, p. 8).

THE DEVELOPMENT OF AN EMOTIONAL AROUSABILITY INSTRUMENT

Factor analyses have shown that Buss & Plomin's (1975) emotionality measures, together with some from the impulsivity scales, define an underlying dimension which overlaps considerably with Eysenck & Eysenck's (1964) N Scale (Braithwaite *et al.* 1984; Costa & McCrae, 1980*a*). To derive a neuroticism scale from these items, however, results in an instrument which is heavily dominated by negatively worded items. Such a measure runs the risk of eliciting an acquiescence response bias and arousing awareness of projecting a socially unacceptable image.

As a consequence, reversals were written for as many items as possible and piloted among a randomly selected sample of 131 persons aged 18 and over within the city of Canberra, Australia. On the basis of these analyses, 15 items were selected for further testing as a scale

which would provide an alternative measure of emotional arousability or neuroticism.

THE SCALE OF EMOTIONAL AROUSABILITY (SEA)

Following Buss & Plomin's (1975) example, the SEA is comprised of items selected within a clearly articulated sampling frame. While considerable attention has been focused on sampling populations of persons over the years, relatively little interest has been shown in sampling the items that make up a psychological test. More often than not, a scale is composed of vaguely similar items that are found to correlate with each other, and the concept being measured is subsequently defined tautologically as that which the scale measures. While McKennell (1974) has highlighted the neglect of those involved in scale construction to select items comprehensively and representatively from a well-defined 'universe of content', Guttman (1959) has provided useful and rigorous guidelines for solving the problem. While neither the author nor Buss & Plomin faithfully adhere to Guttman's facet theory (Guttman, 1959; Foa, 1965), the SEA satisfies the basic principle of delineating the components of emotional arousability and selecting only those items which reflect these components.

The 15-item SEA which appears in the Appendix is comprised of 6 items representing general emotionality, and 3 items tapping each of the more specific components of timidity, anger and lack of control. Nine items are worded so that endorsement reflects high emotional arousability, while 6 items are worded so that endorsement indicates low emotional arousability. Respondents were asked to describe the sort of person they were on a 5-point rating scale, ranging from very unlike me (1) to very like me (5).

THE PSYCHOMETRIC PROPERTIES OF THE SEA

In the following discussion of the reliability and validity of the SEA, data will be drawn from four separate studies. In all these studies, the SEA items were embedded in a longer questionnaire which included measures of other traits such as sociability and activity. The General Popula-

tion I (GP I) data set was obtained from Duncan-Jones' (1985) longitudinal research project on the aetiology of neurosis. The sub-sample was randomly selected within the city of Canberra and comprised 290 respondents, 119 males and 171 females. The General Population II (GP II) data set was collected as part of Hodge's (1983) study of attitudes to skin cancer among a random sample of 70 male and 88 female Canberra residents. Personality inventories were completed by 131 of these respondents. University students (S) provided the third source of data. One hundred and ninety-five introductory psychology students, 126 of whom were female and 69 male, completed the SEA along with other personality items in a classroom situation. Of these students, 136 also completed several additional personality inventories. The fourth source of data was the carers' (C) study in which 138 providers of support to frail elderly people completed a self-completion questionnaire about caring difficulties, coping strategies and personality (Braithwaite, 1986). One hundred and three were women and 35 were men.

RELIABILITY OF THE SEA

The reliability of the SEA was evaluated by examining the consistency of responses across items using Cronbach's alpha reliability coefficient. These coefficients were calculated not only for the total scale, but also for the four components of the scale.

From Table 1, the alpha coefficients for the SEA proved to be very satisfactory, with values of 0.78 and 0.83. Similarly, the general emotion-

Table 1. Cronbach's alpha reliability coefficients for the SEA and its components in the GP I ($N = 290$), GP II ($N = 131$), S ($N = 195$) and C ($N = 138$) data sets

	Data set			
	GP I	GP II	S	C
Components				
General emotionality	0.67	*	0.74	0.81
Anger	*	0.49	0.56	0.49
Timidity	*	0.52	0.52	0.65
Lack of control	0.62	0.51	0.47	0.50
SEA	*	*	0.78	0.83

* The scale was not administered in its final form in this sample. In all other cases, scale items were identical across samples.

Table 2. Intercorrelations among the SEA components in the S ($N = 195$) and C ($N = 138$) data sets

Components	Anger		Timidity		Lack of Control	
	S	C	S	C	S	C
General emotionality	0.33	0.45	0.56	0.39	0.35	0.40
Anger			0.02	0.22	0.29	0.28
Timidity					0.28	0.27

Table 3. Test-retest reliability coefficients for the general emotionality components of the SEA across various time intervals

Time interval (weeks)	Reliability coefficient r (N)
4	0.83 (95)
11	0.79 (92)
22	0.72 (94)
34	0.70 (87)

ality component showed a high level of internal consistency, with coefficients ranging from 0.67 to 0.81. The remaining components had fewer items and, not surprisingly, lower internal consistency coefficients. Nevertheless, the alpha coefficients were sufficiently high to support the inferred commonality of the times, though not of a magnitude to recommend separate use of these subscales. As the components stand, their relatively high correlations with each other (see Table 2) compared with their internal consistency coefficients suggest that they be used as originally intended, as part of the Scale of Emotional Arousability.

The above discussion has been concerned with reliability as consistency of response across items. The question of response stability across time, however, is equally important when dealing with an enduring trait such as neuroticism. If the SEA measures neuroticism, one would expect test-retest correlations to reflect a considerable degree of stability from one point in time to the next. To date, the only information available on this issue comes from Duncan-Jones' longitudinal study on the aetiology of neurosis. Follow-up data on the general emotionality component of the SEA was obtained at 4, 11, 22 and 34 week intervals. From Table 3, it can be seen that the test-retest reliabilities ranged from 0.70 to 0.83. As such, they compare favourably with the reliabilities reported for similar instruments (McCrae, 1983; Ormel, 1983; Plomin, 1974; Spielberger *et al.* 1970). Whether or not this pattern of results can be sustained for the SEA as a whole is a question which must await further research.

CONSTRUCT VALIDITY

If the SEA measures neuroticism as originally conceptualized by Eysenck & Eysenck (1964), correlations with the N Scale should be reasonably high, though not so high as to indicate that the two scales are absolutely identical. As predicted, the correlation between the N Scale and the SEA in the student data set was a moderately strong 0.58 ($N = 136$, $P < 0.001$), reflecting considerable overlap in content while preserving the distinctiveness of each instrument. The correlation of the SEA with extraversion was a negligible 0.03 ($P > 0.05$).

Another instrument reputed to tap neuroticism, at least in part (Gossop, 1981), is the Taylor Manifest Anxiety Scale (Taylor, 1953). This measure proved to have strong and comparable relationships with the SEA and the N Scale, the correlations being of the order of 0.54 ($N = 136$, $P < 0.001$) and 0.69 ($N = 136$, $P < 0.001$) respectively in the student sample.

Further support for the construct validity of the SEA can be found by examining its relationship to other measures known to be related to neuroticism. As vulnerability to neurosis, the N Scale has consistently correlated well with measures of neurotic illness (Henderson *et al.* 1981; Duncan-Jones, 1985). So too does the SEA. From the carers' data set, 124 had complete scores on both the SEA and the anxiety and depression scales from the Delusions-Symptoms-States Inventory. The SEA correlated 0.55 ($N = 124$, $P < 0.001$) with anxiety and 0.48 ($N = 124$, $P < 0.001$) with depression. Similarly, Henderson *et al.*'s (1981) Four Neurotic Symptoms (4-NS) Index was strongly related to the SEA, the correlation being 0.52 ($N = 124$, $P < 0.001$). These data answer the concerns raised earlier in the paper about common

method variance artificially inflating the correlations obtained when using the N Scale with symptom measures. The findings with the SEA support conclusions based on the N Scale, that the neuroticism trait is highly correlated with neurotic states.

Apart from measures of neurosis, neuroticism has consistently been related to life satisfaction indices, with more neurotic persons reporting lower life satisfaction (Costa & McCrae, 1980*b*). The SEA bears a similar relationship. In the carers' study, the scale correlated -0.32 ($N = 124$, $P < 0.001$) with Bradburn's (1969) Affect Balance Scale, and 0.48 ($N = 124$, $P < 0.001$) with negative affect. The SEA was not related to positive affect, a finding that is consistent with the results of Ormel (1983) and with the conceptualization of neuroticism as emotional vulnerability in the face of aversive rather than attractive stimuli.

Finally, neuroticism has been associated with the concept of private self-consciousness. High scorers on neuroticism are more likely to report a preoccupation with and awareness of their emotional states and physical sensations (Duncan-Jones & Rickwood, 1984). Among students, this finding was replicated using the SEA. The correlation between Duncan-Jones' shortened form (Duncan-Jones & Rickwood, 1984) of Fenigstein *et al.*'s (1975) Private Self-Consciousness Scale and the SEA was 0.37 ($N = 136$, $P < 0.001$). It is of note that the N Scale had a much stronger correlation of 0.62 with private self-consciousness in the same data set. The discrepancy, however, is most likely due to overlap in the items of the Private Self-Consciousness and N Scales. Both contain items that tap day-dreaming and self-reflection.

SEA NORMS

Scale scores on the SEA can range from 15 to 75, with higher scores showing greater emotional arousability. The means and standard deviations for the SEA from the student and carers' data sets are presented in Table 4, along with collapsed frequency distributions. It will be noted that the scale has a consistent slight positive skew, though this is not sufficiently marked to impose a serious limit on its usefulness. Duncan-Jones (1984) has noted a similar skew in N Scale scores obtained from a random sample of the Canberra population.

Table 4. SEA norms from the S($N = 195$) and C($N = 138$) data sets

	Student respondents (%)	Carer respondents (%)
Score intervals		
15-25	2	9
26-35	21	34
36-45	42	39
46-55	27	12
56-65	7	5
66-75	1	1
Skewness	0.43	0.48
Mean	41.44	37.50
S.D.	8.76	9.97

Means and standard deviations for the SEA were examined by age and sex among students and carers. As with the N Scale, females tended to have higher scores than males on emotional arousability while older respondents tended to have lower scores than younger respondents (see Table 5).

DISCUSSION

This paper draws together findings from four separate data bases in which a new measure of neuroticism, the Scale of Emotional Arousability (SEA), was developed and tested. Arising out of a factor analytic study of Buss & Plomin's (1975) EASI-III Temperament Survey (Braithwaite *et al.* 1984), the SEA offers several advantages to research workers who wish to measure the ubiquitous personality trait, neuroticism.

First, the measure is economical, comprising only 15 items in comparison with Eysenck & Eysenck's (1964) 24 items, or McCrae & Costa's (1983) 48 items. Secondly, the instrument focuses on the core conceptualization of neuroticism as the tendency to be easily aroused when threatening circumstances are perceived. The SEA samples items to represent four facets of emotional arousability - general emotionality, anger, timidity and lack of control. Unlike similar instruments, the SEA does not incorporate items that more aptly tap related constructs and domains such as anxiety, depression, self-esteem, introversion and private self-consciousness. As such, the instrument is more suited than other currently available instruments for research in which discrete measures of these related constructs are required.

Table 5. Means and standard deviations for the SEA among students and carers broken down by age and sex

	Data set					
	Students			Carers		
	Mean	s.d.	N	Mean	s.d.	N
Sex						
Males	38.33	8.18	66	36.51	10.11	35
Females	43.12	8.60	125	37.81	10.00	103
Age (years)						
17-25	42.17	8.88	144	—	—	—
26-40	39.69	7.94	36	42.64	12.35	15
41-55	38.54	8.71	11	39.00	8.78	43
56-82	—	—	—	35.77	9.89	78

Variations in sample size are due to missing data.

Thirdly, the SEA is not dominated by negatively valued characteristics as is Eysenck & Eysenck's (1964) N Scale. While 9 items reflect high emotional arousability, 6 items represent low emotional arousability, thereby avoiding problems of acquiescence response bias. The mixture of positive and negative characteristics may also reduce awareness of the research worker's purpose and the resulting pressure to respond in a socially desirable way.

Apart from the advantages it offers, the SEA is proving itself to be a reliable and valid research tool. The scale has been found to have alpha reliability coefficients of 0.78 and 0.83 which compare favourably with the coefficients reported for other, and often much longer, measures of neuroticism. Test-retest reliability is still open to question, but the available data suggest that the SEA is likely to have sufficient stability to justify its use as a trait measure.

In terms of construct validity, the scale correlates well with both Eysenck & Eysenck's (1964) and Taylor's (1953) neuroticism measures. As predicted, no relationship was found with Eysenck & Eysenck's extraversion scale. Furthermore, like the N Scale, the SEA has a slight skew and shows higher emotional arousability among women and the young. The scale also correlates highly with state measures of neurosis such as the DSSI/sAD (Bedford *et al.* 1976) and the 4-NS (Henderson *et al.* 1981), thereby supporting the proposition that emotional arousability indicates vulnerability to neurosis. As predicted, the SEA was negatively correlated with overall life satisfaction as

measured by Bradburn's (1969) Affect Balance Scale, and behaved in accordance with expectations by correlating with negative but not with positive affect. Furthermore, the SEA correlated significantly with a shortened form of Fenigstein *et al.*'s (1975) Private Self-Consciousness Scale, the strength of the correlation being reduced to a level which ensures the distinctiveness of each construct.

The future usefulness of the SEA now rests on two factors. The first involves further empirical investigation of its psychometric properties. The scale needs to be used in new populations, and further attention should be directed towards test-retest reliability, the ordering of the items and predictive validity. The scale has been used to date in conjunction with other personality items to camouflage its nature. The desirability of this strategy needs to be assessed. Some additional instructions might also be warranted to emphasize the scale's trait rather than state quality. The second is a conceptual issue. Earlier in this paper, questions were raised about the precise meaning of neuroticism. Will research be best served by re-defining the neuroticism construct broadly to incorporate related constructs that have already found their way into current measures, or is it preferable to restrict the scope of the construct in both theory and measurement to refer to emotional arousability?

Currently, the literature abounds with claims of statistically significant relationships between supposedly distinct constructs which, on closer examination, share similar item content. If it is not clear empirically where one construct ends

and another begins, inferences cannot be drawn legitimately about the theoretical relationship between the constructs in question. If neuroticism, self-esteem, private self-consciousness and neurosis are to maintain their independent status in the literature, they must be measured independently. If they are to be subsumed within one overriding concept, their redundancy should be clearly acknowledged at the outset and a new umbrella concept should be developed, clearly articulated and systematically measured.

I would like to thank Paul Duncan-Jones for making his data and the results of his analyses available to me, and Jane Hodge and Margaret Goodchild for their assistance with data collection.

APPENDIX

The instructions, components and items* of the SEA

Here are some statements about the way people behave or feel or do things. Read each statement carefully, then decide how well the statement describes the sort of person you are.

Next to the statements is a set of numbers. Please circle the number which best shows how like you or unlike you the statement is. The numbers and their meanings are shown below.

If you decide:

- | | |
|--------------------------------|----------|
| No, this is very unlike me: | circle 1 |
| No, this is not much like me: | circle 2 |
| I am not sure: | circle 3 |
| Yes, this is somewhat like me: | circle 4 |
| Yes, this is very like me: | circle 5 |

Items of the general emotionality component

- I frequently get upset
- There are many things that annoy me
- I am almost always calm - nothing ever bothers me†
- I am somewhat emotional
- I can tolerate frustration better than most†
- It takes a lot to get me mad†

Items of the anger component

- When displeased, I let people know it right away
- I am known as hot-blooded and quick-tempered
- I yell and scream less than most people my age†

Items of the timidity component

- When I get scared, I panic
- I am not easily frightened†
- I usually have no trouble making up my mind†

Items of the lack of control component

- I tend to hop from interest to interest quickly
- I get bored easily
- I have trouble controlling my impulses

* Items are not presented to respondents in this order. They were randomized and interspersed with other trait items.

† These items have reverse scoring.

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