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AN INVESTIGATION OF THE FACTOR STRUCTURE OF THE NOVACO ANGER SCALE

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Abstract. The Novaco Anger Scale is the only scale published that allows for the measurement of anger with relation to Novaco's (1976) widely used model of anger management. This paper is the first to present a statistical analysis of the factor structure of this scale. From a sample of healthcare employees and outpatients with problems with anger control, a factor solution was identified. It is suggested that the items loading on this scale contribute to valid assessment of anger. The implications for the use of the NAS are considered.

Keywords: Anger disorders, anger measurement, factor analysis, cognitive behaviour therapy.

Introduction

The experience of anger that is too frequent, too intense, and has a long duration has been identified as a sufficient precursor to verbal and physical aggression (Novaco, 1994; Unverzagt & Schill, 1989). Research has predominantly focused on evaluating different treatment methods aimed at reducing anger levels (for example, Novaco, 1976). Measures that have dominated the field in anger assessment have been the Buss-Durke Hostility Inventory (Buss & Durke, 1957) and the State Trait Anger Scale (Spielberger & Sydeman, 1994). As Novaco (1994) has established, such measures have been widely used, but they lack any theoretical grounding. Without such adherence to nomothetic principles it is difficult to assess their validity in any meaningful way.

Novaco's (1976) first scale development reflected his interest in defining an individual's experience of anger by considering the situations they found to be provocative, the Novaco Provocation Inventory (also known as the Novaco Anger Inventory: NAI). On this measure the individual was required to respond to each item by considering how angry they would feel in that situation. Although being of obvious clinical value, this measure received little attention in the literature, outside of Novaco's own work.

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Huss, Leak and Davies (1993) published one of the handful of studies to report on the use of Novaco's first scale. In their study, they attempted to establish the concurrent validity of the Novaco Provocation Inventory. Sampling 72 undergraduate students (64% of whom were female), they compared responses on the NAI to those on the Buss-Durke Hostility Inventory (Buss & Durke, 1957), Jackson's (1974) PRF-E, the Burt Scale (Burt, 1980) and the Balanced Inventory of Desirable Responding (Paulhus, 1984). They report correlations between the NAI and these other measures to range from 0.413 and 0.503, concluding that this offered some evidence to support the construct validity of the NAI. Huss et al. (1993) argue that their data help to establish the validity of the NAI. However, the choice of measures should be strongly considered when attempting to establish concurrent and construct validity. The sole purpose of such an exercise is to identify whether the new scale (here the NAI) significantly relates to an already established scale that purports to measure the same constructs (Robson, 1993). In view of this, Huss et al.'s (1993) use of the trait measures to establish the construct validity of a scale that attempts to assess antecedents to anger is somewhat puzzling, and any conclusions regarding what this may add to the validity of the NAI need to be accepted only very tentatively.

Novaco (1975) demonstrated that the NAI possessed a good internal consistency (0.95), and moderate to good test-retest reliability. Selby (1984) found that the NAI could differentiate between violent and non-violent groups with a 90% hit rate. In 1994, Novaco published a reformulated version of the NAI. The new scale comprised a reduced number of items focusing on provocation, and contained a new section, which aimed to assess an individual's experience of anger within Novaco's (1994) information-processing model. The new items were conceptually derived and categorised within three domains, cognitive, arousal, and behavioural. Respondents are required to rate how true they believe each of the items in these domains is of themselves. Novaco's primary motivation for this reformulation was to ensure that the assessment instrument was consistent with his model of anger experiences. Only in this way can data gathered during assessment realistically inform clinical formulation and intervention in any meaningful way.

Novaco (1994) adhered to thorough procedures in the development of the new scale, the Novaco Anger Scale (NAS). This process included reviewing existing measures of anger, retrieving archived clinical data, conducting interviews with care staff, pilot studies with students, interviews and preliminary testing with psychiatric patients, an examination of the predictive validity of the scale and, finally, an integration of these findings in the reconstruction of the scale. Responses to the final version of the scale were then obtained from 158 California State hospital patients. He found the overall scale to possess good internal reliability (alpha = 0.967); however, some subscales yielded only poor to moderate correlations (notably attentional focus and suspicion). Novaco also investigated the prospective validity of the NAS against the Spielberger State Anger scale, which he found to be good. Other than these data produced by Novaco, there have been few attempts to further explore the validity of the NAS within different populations. Furthermore, Novaco has not published data reporting on the factor structure of the NAS. This is usually an important step in the process of identifying the construct validity of a scale, rather than only retaining a conceptually derived structure. Given the proliferation of Novaco's approaches in the treatment of anger problems (e.g. Black, Cullen, Dickens, & Turnbull, 1988; Edmondson & Conger, 1996), further work on the psychometric properties of the NAS are required.

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Method

Design

The main goal of the study was to establish the factor structure of NAS. Thus, it was necessary to recruit a sample that might be considered heterogeneous with regard to their experience of anger.

Participants

Four hundred and thirty healthcare employees were identified from service records within two NHS Trusts in the West Midlands region of the UK. This was a snapshot sample of people employed at the time of the study, and included a range of professions. Responses were received from 124 employees of a Regional Secure Unit, and 99 employees from a service for people with learning disabilities. In total, 37% of the responses were from males. These samples were chosen mainly out of convenience, but it was noted that professionals within these services are likely to encounter a range of provocative events during their typical working day. Although the employees samples were not expected to engage in aggressive behaviour during their work, it was expected that their experience of anger would represent that of any other individual from the general population who does not have clearly identified anger problems. After incomplete and spoiled questionnaire packs had been discarded, there were 212 responses from this group.

A second sample, forming a clinical group, was also recruited as participants in the study. All these participants were individuals who had been referred to a Regional Secure Unit for outpatient anger management training over a 5-year period. Therefore, this sample comprised 334 male and 19 female forensic outpatients who had completed the NAS. Although this sample was not randomly selected, it comprised all individuals who had been referred and assessed over a 4-year period and as such may be considered representative of those people who are referred in this way.

Procedure

Data collection. For the non-clinical sample, participants were sent a questionnaire pack containing the NAS, together with a sheet on which they were to respond to various questions about themselves, such as age, gender, profession, violent offences, and identified anger problems. They were also provided with information about the nature of the study, in which they were informed that the purpose of the study was to assess the range of ''normal'' anger within the general population. All responses were anonymous. Reminder letters were sent 3 weeks after the original mailshot to all participants. They were informed that their choice not to participate in the study was assumed if they did not return the questionnaire pack.

For the clinical sample permission was sought and obtained from the clinicians responsible for the individual's assessment and a retrospective case-note analysis was performed. From this preliminary background information, NAS responses were obtained.

Measures. The measure used in the study was the NAS (1991 version: Novaco, 1994). The NAS comprises 73 items divided into two Parts, with Part A (48 items) assessing the

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individual's experience of anger, and Part B (25 items) assessing the type of events that the individual found to be provocative. For Part A the responses are made on a 3-point scale: ''never'', ''sometimes'', and ''always true'' (with reverse scoring operationalized for items 13 and 16). For Part B the responses are made on a 4-point scale ranging from ''not at all angry'' to ''very angry''. During piloting, it was found that this questionnaire could be completed within 15–20 minutes.

Results

Descriptive statistics

The 212 members of the non-clinical sample had a mean age of 36.57 years (*SD* = 9.93), and the 354 members of clinical sample had a mean age of 34.75 years (*SD* = 10.41). A series of independent samples *t*-tests were performed on the NAS subscales within the non-clinical and clinical samples to compare male and female scores. After making the required Bonferroni correction, no statistically significant differences were found between males and females. NAS subscale scores were compared between the non-clinical and clinical group using a series of independent sample t-tests accounting for an assumption non-equal variances. These data are presented in Table 1.

Table 1. Independent *t*-test with separate variance estimates results comparing non-clinical and clinical group

NAS Subscale	Mean Non-clinical	Mean Clinical	*t*-value sep. var. est.	*df*	*p*
Attentional Focus	7.65	9.16	–12.10	510.20	< .001
Rumination	6.51	8.98	–16.70	552.57	< .001
Hostile Attitude	5.46	7.84	–15.29	560.79	< .001
Suspicion	6.83	7.93	–10.86	544.23	< .001
Intensity	6.05	9.04	–19.62	559.40	< .001
Duration	6.30	8.34	–12.84	544.38	< .001
Somatic Activation	6.22	8.45	–13.92	529.52	< .001
Irritability	6.86	8.42	–10.83	542.44	< .001
Impulsive Reaction	5.71	9.42	–21.64	562.08	< .001
Verbal Aggression	5.96	8.61	–17.86	549.86	< .001
Physical Confrontation	4.83	8.57	–26.68	555.26	< .001
Indirect Expression	6.07	7.99	–12.70	552.35	< .001
Disrespectful Treatment	10.80	13.65	–11.09	547.77	< .001
Unfairness/Injustice	12.95	15.01	–8.37	485.72	< .001
Frustration/Interruption	10.77	13.65	–11.36	556.49	< .001
Annoying Traits	10.06	13.19	–10.34	537.29	< .001
Irritations	8.05	11.87	–13.74	562.90	< .001
Cognitive Domain	26.45	33.91	–17.86	553.97	< .001
Arousal Domain	25.43	34.26	–17.85	558.04	< .001
Behavioural Domain	22.57	34.60	–24.16	560.20	< .001
Total	74.46	102.77	–21.90	562.99	< .001

df are expressed in exact terms, as *t*-tests with separate variance estimates were used, alternatively; *df* = 563.

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Reliability analysis

The internal reliability of the NAS was assessed using Cronbach's alpha statistic. Cronbach's alpha for the NAS total scale showed that it possesses good internal consistency ($\alpha = 0.97$). Across the 48 items of Part A of the NAS, the average inter-item correlation was 0.37. To assess the reliability of individual items, their correlation with the total scale was examined. Five items had poor item-total correlations (i.e. all < 0.45): item 13 (''When a person says something that offends me, I just stop listening''), item 16 (''People can be trusted to do what they say''), item 42 (''When I get mad at someone, I give them the silent treatment''), item 44 (''It bothers me when someone does things the wrong way''), and item 48 (''If someone makes me angry, I'll tell other people about them''). Therefore, these five items were excluded from further analysis.

Exploratory factor analysis

For the item-level factor analysis of the NAS, responses from both the non-clinical and clinical groups were used ($n = 565$). As the factor analysis was only being performed for the reliable items of Part A of the NAS (number of items = 43), there was a participant to variable ration of greater than 10:1. Such a ratio is in keeping with recommendations of Kline (1994), Streiner (1994), and Gorusch (1983). The number of factors to be extracted, the placement of communalities and choice of rotation were varied with the aim of producing simple structure. As the resultant factors would inevitably be associated with anger, it was assumed that they might not be orthogonal. Thus hierarchical factor analysis was used (Wherry, 1984).

The hierarchical analysis was performed after data extraction using the principal axis method, with varimax normalized rotation. The model explained 49.97% of the total variance of the scale. It yielded three primary factors and one secondary (general) factor. Factor loadings are presented in Table 2. The correlations for the three primary (oblique) factors are presented in Table 3.

Evidently, all the items included in the analysis loaded on the secondary factor. This most likely represents a general anger factor, a theme common across all items. Ten items loaded onto primary factor 1. Item 39 of the NAS (''When I don't like somebody, there's no point in being nice to them'') had the highest loading on this factor. Other items referred to being prepared to retaliate or dwell on anger arousing events. Individuals scoring high on these items are likely to experience high levels of rumination associated with their anger and feel that vengeance is justified. A suitable label for this factor might be ''Retaliatory hostility''.

Ten items loaded on primary factor 2. The item with the highest loading was item 14 (''I can't sleep when I have been done wrong''). Other items refer to general cognitive or physiological arousal. High scores across these items may represent prolonged experiences of agitation and irritation, which in turn contribute to heightened levels of physical tension. An appropriate label for this factor might be ''Vigilant arousal''.

Five items load on primary factor 3. Item 24 (''When I get angry, I throw or slam things'') had the highest loading on this factor. Other items similarly related to indirect aggression or belligerence. High scores across these items would indicate a tendency to displace aggression when aroused, which may result in indirect displays of anger and aggression. A suitable label for this factor might be ''Indirect aggression''.

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Table 2. Hierarchical factor analysis: Primary factor loadings

NAS item	Primary 1	Primary 2	Primary 3
NAS 11	0.351	–0.082	–0.020
NAS15	0.335	–0.057	–0.068
NAS22	0.272	–0.018	–0.033
NAS23	0.251	–0.031	–0.060
NAS26	0.262	0.072	–0.059
NAS27	0.359	0.004	–0.104
NAS34	0.270	0.094	–0.118
NAS35	0.326	–0.125	0.034
NAS39	0.376	–0.026	–0.133
NAS47	0.269	0.072	–0.095
NAS4	0.033	0.330	–0.085
NAS7	–0.110	0.216	0.137
NAS14	–0.126	0.385	0.000
NAS19	–0.108	0.279	0.107
NAS25	0.085	0.249	–0.077
NAS28	0.042	0.302	–0.131
NAS31	–0.089	0.369	–0.018
NAS32	–0.010	0.253	0.032
NAS38	–0.061	0.273	0.054
NAS40	0.039	0.314	–0.117
NAS12	–0.086	0.073	0.279
NAS24	–0.090	–0.007	0.330
NAS29	–0.060	–0.021	0.328
NAS33	0.162	–0.164	0.248
NAS36	–0.002	–0.025	0.233

Table 3. Correlations of oblique factors

Oblique factor	Primary 1	Primary 2	Primary 3
Primary 1	—	0.84	0.89
Primary 2	0.84	—	0.86
Primary 3	0.89	0.86	—

Fourteen items fail to load on any of the primary factors, namely items: 1, 2, 3, 5, 6, 8, 9, 10, 17, 18, 20, 21, 41, 45. However, all these items load on the secondary (general) factor. Broadly, these items refer to dispositional characteristics. For example, ''I walk around in a bad mood'' (item 8), ''Every week I meet someone I dislike'' (item 3) and ''My temper is quick and hot'' (item 9). Thus these items are related to general high anger scores, yet do not appear to relate well to the identified factors.

Clinical utility of derived factors

In order to allow for the factors derived in the present study to contribute to clinical assessment and further research, the mean scores for the clinical and non-clinical groups for each

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Table 4. Mean scores and independent *t*-tests results for the derived factors

Derived factors	Non-clinical		Clinical		*t*-value
	Mean	*SD*	Mean	*SD*	(*df* = 563)
Secondary (''General Anger'')	65.45	10.89	93.46	18.66	−19.91*
Primary 1 (''Retaliatory Hostility'')	13.30	2.92	20.79	5.05	−19.71*
Primary 2 (''Vigilant Arousal'')	16.38	3.22	21.63	4.55	−14.76*
Primary 3 (''Indirect Aggression'')	7.00	1.93	10.71	3.01	−16.08*

* indicates that $p < .001$.

of the factors are presented in Table 4. A series of independent *t*-tests were carried out on these data, indicating that each factor yielded significantly different scores for the clinical and non-clinical groups.

Discussion

This paper represents the first attempt to identify the factor structure of the NAS. Curiously, Novaco's (1994) exhaustive description of the development of the revised scale omitted a factor analysis. Although factor analytic techniques are abhorred by some (Kline, 1994), they offer an additional means of statistically validating a measurement instrument, thereby enhancing its utility for research and clinical practice.

The limitations of the present study need to be addressed. The sample comprises a group of health service employed volunteers, and a group of clinical participants. The ''normal'' volunteers were assumed to experience anger within the parameters of the general population; however, claims to their representativeness of such a population are clearly unwarranted. The clinical sample comprised individuals who presented as outpatients at a clinical psychology department within a forensic setting, who experienced significant problems in controlling their anger. All members of the clinical sample had been involved in aggressive or violent behaviour prior to their being assessed. For the purpose of this study, however, it is perhaps an oversight not to have discriminated between those individuals for whom aggressive behaviour was mediated by anger and those for whom it had some instrumental purpose not requiring them to become angered. A further limitation was not including items that tap into socially desirable responding and over-reporting of difficulties. Ideally, such items should be included in order to detect the presence of responding that may be considered to ''fake good'' or ''fake bad''. In line with these limitations, it is essential to consider the findings of the study with some caution.

The main goal of factor analysis is the reduction of the available data to a simple structure, where latent variables are able to adequately account for the majority of the variance in the scale and provide theoretically useful item grouping. Although a true simple structure was not obtained in this study, the model presented does account for a reasonable amount of the variance within the scale. The factors derived in the study were not consistent with the conceptual subscales identified by Novaco (1994). However, from their content they appear to summarize seemingly useful additional subscales for the NAS. Unfortunately, the third factor identified, labelled ''Indirect aggression'', contains few items. This finding may therefore be spurious for two reasons. First, this may simply be an example of bloated specifics,

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with too few loadings to confirm this as a meaningful factor. Second, an examination of the item content shows that the items are worded similarly. Therefore, rather than identifying an actual factor, this finding may simply be tautological. The general (secondary) factor supports the clinical utility of considering the total score for the NAS, with the exception of the items omitted due to their apparent poor reliability.

The derived factors yielded significantly different scores when the non-clinical participants were compared to the clinical participants. For clinical use the derived factors may therefore comprise useful additional subscales for the NAS. Theoretically, of most interest to clinical assessment might be scores on the factor labelled as ''Retaliatory hostility'', as this is likely to measure an individual's tendency to respond to provocation and anger arousal in a hostile or violent manner.

The aim of this paper was to further develop the psychometric profile of a well-used measure of anger problems. It seemed salient to consider this, as a revised version of the scale may be published soon, and to date no studies have commented on the factor structure of the NAS. Unfortunately, a number of problems with the scale were identified. First, five items were found to have poor item-total correlations, which excluded them from factor analysis. From Novaco (1994) it is evident that the conceptual scales to which these items contribute have the lowest internal consistency. Second, despite testing repeated models in exploratory factor analysis, the closest model to a simple structure accounted for less than 50% of the variance of the total scale. Given the large sample size and the otherwise good internal consistency of the scale, this suggests that the response criteria on the scale may be too narrow. In the version of the NAS examined here, responses are made on a 3-point scale. This allows for little response variation and may therefore increase measurement error and the transparency of underlying factors. Thus, a recommendation for further scale development would be to increase the range of responses possible, perhaps to a 5- or 7-point scale.

This paper has presented the results of an exploratory factor analysis of the NAS. A general factor was derived that may validate the use of the total score of the scale in assessing individuals with anger difficulties. Although the model derived accounted for less than 50% of the variance of the scale and five items were excluded from the analysis, the derived factors appear to have some clinical utility that might further aid the assessment of individuals with anger disorders and a consideration of their likely risk. The next step in the evaluation of the NAS would be a confirmatory factor analysis with a similar sized heterogeneous sample.

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References

Black, L., Cullen, C., Dickens, P., & Turnbull, J. (1988). Anger control. *British Journal of Hospital Medicine, April*, 325–329.

https://doi.org/10.1017/S1352465803004041 Published online by Cambridge University Press

Burt, M. R. (1980). Cultural myths and support for rape. *Journal of Personality and Social Psychology, 38*, 217–230.

Buss, A. H., & Durke, A. (1957). An inventory for assessing different kinds of hostility. *Journal of Consulting Psychology, 21*, 343–349.

Edmondson, C. B., & Conger, J. C. (1996). A review of treatment efficacy for individuals with anger problems: Conceptual, assessment, and methodological issues. *Clinical Psychology Review, 16*, 251–275.

Gorusch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Huss, M. T., Leak, G. K., & Davis, S. F. (1993). A validation of the Novaco Anger Inventory. *Bulletin of the Psychonomic Society, 31*, 279–281.

Jackson, D. N. (1974). *Personality research form manual*. Goshen, NY: Research Psychologist Press.

Kline, P. (1994). *An easy guide to factor analysis*. London: Routledge.

Novaco, R. W. (1975). *Anger control: The development and evaluation of an experimental treatment*. Lexington, MA: DC Health.

Novaco, R. W. (1976). The function and regulation of the arousal of anger. *American Journal of Psychiatry, 133*, 1124–1128.

Novaco, R. W. (1994). Anger as a risk factor for violence among the mentally disordered. In J. Monahan & H. J. Steadman (Eds.), *Violence and mental disorder: Developments in risk assessment*. Chicago: The University of Chicago Press.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology, 46*, 598–609.

Robson, C. (1993). *Real world research: A resource for social scientists and practitioner-researchers*. Oxford: Blackwell.

Selby, M. J. (1984). Assessment of violence potential using measures of anger, hostility, and social desirability. *Journal of Personality Assessment, 48*, 531–544.

Spielberger, C. D., & Sydeman, S. J. (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcome assessment* (pp. 292–321). Hillsdale, NJ: Lawrence Erlbaum Associates.

Streiner, D. L. (1994). Figuring out factors: The use and misuse of factor analysis. *Canadian Journal of Psychiatry, 39*, 135–140.

Unverzagt, F. W., & Schill, T. (1989). Anger assessment and its relation to self-report of aggressive behavior. *Psychological Reports, 65*, 585–586.

Wherry, R. J. (1984). *Contributions to correlational analysis*. New York: Academic Press.

https://doi.org/10.1017/S1352465803004041 Published online by Cambridge University Press

https://doi.org/10.1017/S1352465803004041 Published online by Cambridge University Press