
THE REVISED FACTOR STRUCTURE OF THE DISSOCIATIVE ABILITY SCALE: A MEASURE OF NON-PATHOLOGICAL DISSOCIATION

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ABSTRACT

Originally viewed as a psychiatric cognitive deficit, dissociation has been suggested to be normative and even adaptive in certain instances in non-clinical populations. This study aims to optimize the Dissociative Ability Scale (DAS), a novel self-report instrument to measure the ability to experience normative dissociation. To bolster the model fit, internal consistency, and factor structure of the DAS we conducted an internet-based survey ($n=833$) aiming to guide scale optimization by item-pruning based on sequential exploratory factor analysis. The results indicated that a seven-item, two-factor structure is optimal, producing good model fit and excellent internal consistency. The factors were renamed Ability to Focus Attention (FA) and Ability of Vivid Imagination (VI). Further investigation is suggested to confirm the validity and internal consistency of the new structure in additional normative samples. With subsequent confirmatory research, the DAS may be a reliable and valid scale to measure non-pathological dissociative ability.

Keywords: dissociation, normative dissociation, scale development

INTRODUCTION

Dissociation is defined as an altered state of consciousness where the typical integration of identity, memory, or perception of the environment is temporarily disconnected from awareness (Seligman & Kirmayer, 2008; Spiegel & Cardeña, 1991). Originally viewed as a psychiatric cognitive deficit, some dissociation has been suggested to be normative and even adaptive in certain instances in non-clinical populations (Butler, 2006; Dell & O'Neil, 2010; Fisher et al., 2013; van der Hart & Horst, 1989). In contrast to pathological dissociation, normative or adaptive dissociation implies a change of consciousness that entails a brief, temporary separation of integrated mental processes, does not impair functioning, and is not attributable to a psychiatric disorder or trauma history (Butler, 2006; Dell & O'Neil, 2010; Fisher et al., 2013). Theorists suggest that dissociative experiences may fall into distinct types as well as range on a spectrum of severity, spanning from a familiar feeling of being on autopilot while driving a car to acute amnesia that results from dissociative identity disorder (Bernstein & Putnam, 1986; Butler, 2006; Holtgraves & Stockdale, 1997; Putnam et al., 1996). Despite the

ubiquity in everyday life, there is still a scarcity of research regarding the understanding and measurement of normative dissociation.

Presently, the Dissociative Experiences Scale (DES), a 28-item self-report scale, is the most widely used tool to screen and measure dissociations in both clinical and non-clinical populations (Bernstein & Putnam, 1986). However, the DES was originally designed to measure dissociation within clinical populations, using the DSM III criteria for dissociation. Typically, using the DES within normative populations leads to skewed item responses and a floor effect, which renders the DES less sensitive to individual differences among healthy individuals (Dienes et al., 2009; Holtgraves & Stockdale, 1997; Nadon et al., 1991; van Ijzendoorn & Schuengel, 1996). These findings suggest that the DES is not an ideal tool to measure normative dissociation in non-clinical samples, and by design, it is incompatible with the findings endorsing the theories that view dissociation capacity as a potentially useful and adaptive ability rather than an illness (de Ruiter et al., 2006; Butler, 2006; Fisher et al., 2013; van der Hart & Horst, 1989).

Although non-clinical measures of adaptive information processing style have been created – such as the Tellegen Absorption Scale (TAS) (Tellegen & Atkinson, 1974), the Dissociative Processes Scale (DPS) (Harrison & Watson, 1992) and the Attentional Resource Allocation Scale (ARAS) (Carleton et al., 2010) – these scales may not be ideal for measuring normative dissociation (Harrison & Watson, 1992; Carleton et al., 2010). The TAS surveys some 'hypnosis-like' experiences in normative populations, however, the primary construct is examining attention and is lengthy, being composed of 34 questions. The DPS lacks subsequent reliability and validity studies with large sample sizes to elucidate the scale's psychometrics or construct validity and the ARAS's primary purpose is to evaluate attention across mood, anxiety, and personality disorders. Thus, there is still a need for a brief, reliable self-administered scale that measures the ability of normative dissociation in non-clinical populations.

This need inspired the development of the Dissociative Ability Scale (DAS). This scale is rooted in the theory that healthy individuals have the ability to adaptively dissociate in everyday life in varying degrees (de Ruiter et al., 2006; Fisher et al., 2013). The DAS was originally designed as a non-pathological scale mirroring the DES, resulting as a 17-item, self-administered instrument that examines two factors of normative dissociation, autopilot and autoscopy (Fisher et al., 2013). Autopilot is equivalent to intense imaginative involvement, which may lead to brief slips of conscious awareness comparable to amnesic events. Autoscopy is parallel to depersonalization, or the experience of feeling outside oneself. A previous study conducted by Fisher et al. (2013) demonstrated that the DAS has acceptable convergent and divergent validity. Yet, inconsistencies were identified in item composition and factor structure, necessitating further research in scale development. In addition, model fit of the hypothesized factor structure was not tested.

In order to address these inconsistencies in item composition and factor structure, we conducted an internet-based survey and used the data to perform exploratory and confirmatory factor analyses to optimize the scale. We hypothesized that the DAS will show good internal consistency, scores will show normal distribution, and that there will be no indication of a floor or ceiling effect in a non-clinical population.

METHOD

STUDY PARTICIPANTS AND MEASURES

Nine hundred seventy individuals completed an internet-based survey containing the DAS through Amazon Mechanical Turk. The mean age was 35.57 years ($SD = 12.03$, range 17–76) and 58 per cent of the sample were females. The study was approved by the Baylor University Institutional Review Board (IRB ID: 358517-2).

The Dissociative Ability Scale (DAS) (Fisher et al., 2013) is a self-report questionnaire designed to measure non-pathological dissociation. The questionnaire contains 17 items, which are grouped into two subscales, Autopilot (items 1, 4, 5, 7, 8, 9, 12, 14, 15 and 17) and Autoscopy (items 2, 3, 6, 10, 11, 13, 16). In the questionnaire respondents rate the degree to which they agree with certain statements about their ability to have dissociative experiences on a 1–5 Likert scale. For example, item 5 is: 'I have the ability to get so completely caught-up in my thoughts that I can become totally unaware of the passage of time'. The DAS has been shown to have good reliability and validity, with a Cronbach's alpha of 0.949 (Fisher et al., 2013).

DATA ANALYSIS

Data gathered in the internet survey was used to find the optimal item composition and factor structure for the DAS through a series of factor analyses and analysis of internal consistency. Participants who had more than one missing value among the DAS items were excluded from analysis. From the 833 participants with valid data, 24 (2.88%) missed only a single DAS item during the completion of the survey. In these cases, data was imputed using a linear regression approach using the values of the other 16 items as predictors.

An initial confirmatory factor analysis (CFA) was performed in R v.3.1.2 using the *lavaan* package v.0.5-17. Maximum likelihood estimation was used with robust standard errors and Satorra–Bentler scaled test statistics, because the data were not multivariate normally distributed. First, the fit of the original factor structure of the DAS (Fisher et al., 2013) was tested on the data.

Next, an exploratory factor analysis (EFA) was performed on the data in R v.3.1.2 using the *psych* package v.1.5.1, to optimize the factor and items structure of the scale. The EFA applied ordinary least squares factoring and oblimin rotation. Prior to the EFA, four items showing a floor effect were excluded based on visual examination of the histogram and frequencies matrix so as to exclude items insensitive to individual differences in the non-clinical population. Items retained through this process underwent a number of evaluative procedures, such as test for multivariate normality (using the Royston's H test and by examining the chi-squared QQ plot), Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The correlation matrix was also examined visually to identify multicollinearity or uncorrelatedness. The factor analysis was run on the polychoric correlation matrix instead of the normal Pearson correlation matrix because the assumption of multivariate normality was violated. Optimal numbers of factors were determined based on the scree plot and very simple structure (VSS) criterion. Factor scores were extracted from the structure matrix. The EFA was completed in several iterations. At each iteration, communality of the items and factor loadings were examined. Items with low communality or very low factor loadings

were excluded one by one to improve model fit and communality. After arriving at the final item structure with EFA, the data were resubmitted to the multivariate normality, KMO, and Bartlett's tests to prepare for CFA.

Next, model fit was tested with a second confirmatory factor analysis using the final solution of the EFA. Furthermore, CFA was repeated using the final items of the best EFA solution but using a single factor structure as a model to evaluate the validity of a single 'composite score' derived from the scale.

RESULTS

From the factor analysis results, 137 (14.12%) participants had more than one missing value in the DAS items, (this frequency of missing values is not uncommon in internet-based surveys). All participants with more than one missing value in the DAS were omitted from analysis. Thus, the final sample size was 833.

The initial CFA and item analysis using original factor structure of the DAS showed poor model fit. $\chi^2/df = 10.35$; RMSEA = 0.106 (90% CI 0.101, 0.111); Tucker–Lewis index (TLI) = 0.755, comparative fit index (CFI) = 0.787. Furthermore, items 10, 11, 12, and 13 (10. 'I have the ability to be so internally engaged that I can feel disconnected from my body', 11. 'I have the ability to focus inwardly so completely that I can feel like I am standing next to myself or I am watching myself as if I was looking at a different person', 12. 'I have the ability to allow my unconscious mind to control my behavior so that my actions seem involuntary', 13. 'I have the ability to feel like a robot') showed heavy positive skew and a floor effect, with most participants selecting the lowest possible value on the scale. The poor results of the CFA and the limited range of responses on some of the items confirmed the need for the optimization of the scale. As a first step of scale optimization, heavily skewed items (10, 11, 12, and 13) were omitted.

Next, EFA was performed to find the optimal item and factor structure. Scree plot and VSS criteria indicated a two-factor solution to be optimal. Items 4, 1, 15, 16, and 17, and 16 were dropped sequentially because of their low communality (< 0.3), and 14 because of its low and bipolar loading on both factors. Finally, the EFA yielded a seven-item two-factor model with a mean communality of .57. The final items retained were items 5, 7, 8, and 9 for the first factor and 2, 3, and 6 for the second factor from the original questionnaire. Factor loadings and communality statistics are listed in Table 1. All items in Factor 1 were in the autopilot factor and all items in Factor 2 were in the autoscopia factor according to the original factor structure. However, the old factor names no longer represented the included items accurately. Thus, the factors were renamed to Factor 1: Ability to Focus Attention (FA) and Factor 2: Ability of Vivid Imagination (VI). A subsequent CFA confirmed that the new item set explains two latent constructs. The seven-item two-factor model yielded good model fit indices, $\chi^2/df = 4.890$, RMSEA = 0.068 (0.053, 0.084), TLI = 0.951, CFI = 0.969.

A one-factor model was also tested with EFA and CFA, to assess the consistency of a DAS composite score. The mean communality of the model was low according to the EFA (0.46) with three items having a communality of lower than 0.4. Furthermore, the CFA yielded poor fit indices. $\chi^2/df = 16.185$; RMSEA = 0.135 (90% CI 0.122, 0.149); TLI = 0.806; CFI = 0.870. Because of the poor model fit, the one-factor solution was not used in later analyses.

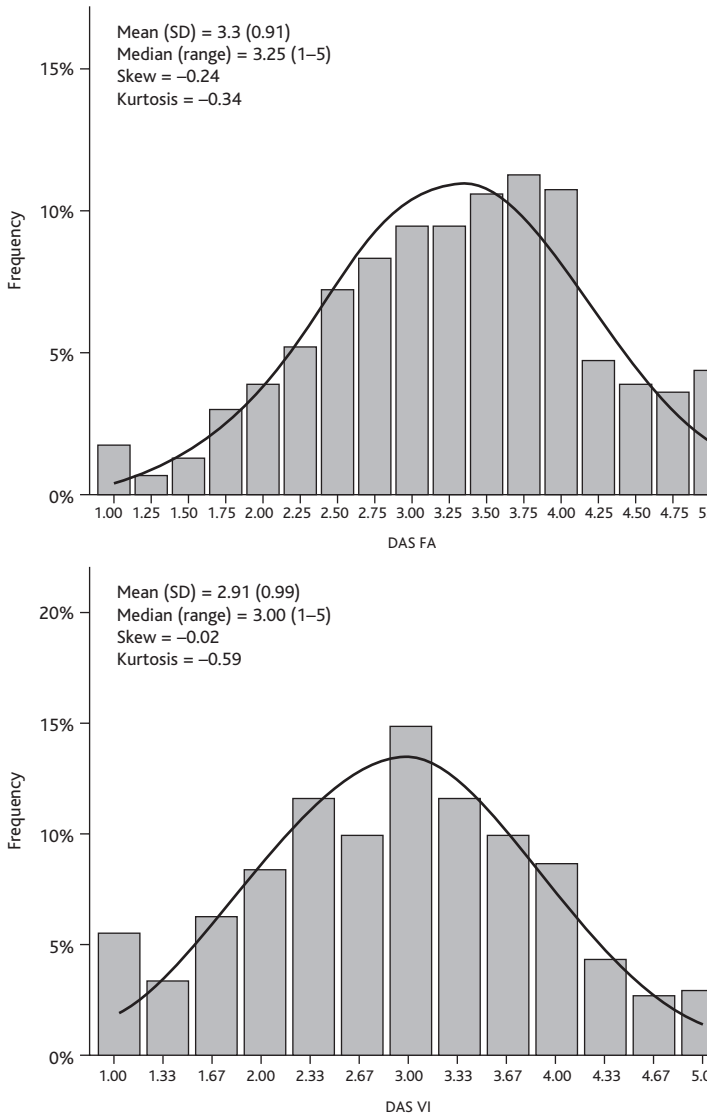
As depicted in Figure 1, the distribution of both new DAS factor scores were close to normal with FA showing very slight negative skew, while VI showing very slight positive skew.

Table 1. Results of the final solution of the exploratory factor analysis

	Items	New factor name	Item number	Ability to Focus Attention (FA)	Ability for Vivid Imagination (VI)	Community (mean = 0.63)
8	I can focus so completely that I lose track of what is happening around me.	FA	8	0.93	-0.02	0.80
7	I have the ability to go on automatic pilot during a familiar task.	FA	7	0.67	-0.05	0.43
9	I have the ability to be so absorbed in a television show or movie that I can become unaware of other events that are occurring around me.	FA	9	0.65	0.07	0.48
5	I have the ability to get so completely caught up in my thoughts that I can become totally unaware of the passage of time.	FA	5	0.63	0.08	0.61
3	Some of my daydreams and fantasies can become so vivid that I am able to feel like it is actually happening.	VI	3	0.03	0.83	0.72
2	I have the ability to recall an event so vividly that I feel as though I am actually reliving it.	VI	2	-0.05	0.80	0.59
6	I can observe my behavior as if I am watching someone else.	VI	6	0.17	0.52	0.38

Note: Exploratory factor analysis yielded a two-factor model with seven items. Factor structure and item loadings are listed.

Figure 1 Distribution of optimized DAS factor scores, Focused Attention and Vivid Imagination



Note: Item scores were averaged to produce subscale scores.

The results of the internal consistency analysis of the new DAS scale with the optimized item structure is depicted in Table 2. The reliability of FA and VI was .80 (95% CI .76, .85) and .74 (95% CI .67, .81) respectively, indicating acceptable reliability. Item–total and item–rest correlations indicated high correspondence between item and factor scores, with the exception of DAS 6 in VI which had an item–rest correlation of .49. The deletion of none of the items resulted in improvement in the alphas, and the item scores within the factors are characterized by very similar mean and standard deviation, further supporting the consistency of the items.

Table 2. Item–total and item–rest correlations and descriptive statistics

Factor	Original item number	Item–total correlation	Item–rest correlation	Mean (SD)
FA	DAS 8	0.86	0.73	3.3 (1.1)
	DAS 5	0.81	0.65	3.3 (1.1)
	DAS 7	0.73	0.53	3.5 (1.1)
	DAS 9	0.78	0.59	3.1 (1.2)
VI	DAS 2	0.82	0.6	3.2 (1.2)
	DAS 3	0.85	0.62	2.9 (1.3)
	DAS 6	0.77	0.49	2.6 (1.2)

DISCUSSION

Although commonly viewed as pathological, dissociation may be frequent, normative, and even adaptive in some situations in non-clinical populations (Butler, 2006; van der Hart & Horst, 1989). The non-pathological, everyday dissociative experiences such as daydreaming or being engrossed in an exhilarating film may be classified as normative dissociation. It has been proposed that normative dissociation should be viewed as an ability rather than a characteristic of disorder, for it is a behaviour that may be beneficial depending on the context generating the dissociative experience (de Ruiter et al., 2006; Dell & O'Neil, 2010; Fisher et al., 2013). Absorption, for example, allows the ability to allocate cognitive resources with concentrated attention on a desired stimulus (or group of stimuli) and thereby provides a decrease in inward and even outward distraction. Additionally, daydreaming has been associated with reflection and problem solving, due to daydreams consisting of planning and envisioning a variety approaches to a certain situation (Butler, 2006; Klinger, 1971). These adaptive aspects of normative dissociation are similar to the therapeutic uses and benefits of clinical hypnosis in reducing stress (Fisher et al., 2013; Spiegel & Spiegel, 2004). In fact, the non-pathological theory of dissociation originates from the literature of hypnotic experiences, with research supporting the association between the ability to dissociate and the ability to be hypnotized (Fisher et al., 2013; Green, 1997; Zachariae et al., 2000). With everyday dissociation experiences being both prevalent and potentially adaptive, many suggest that the measurement of dissociation experiences are important for research and clinical practice alike.

The Dissociative Ability Scale (DAS) was developed to measure the ability of normative dissociation (Fisher et al., 2013). Although the original DAS demonstrated impressive convergent and divergent validity, the inconsistencies in item composition and factor structure warranted further study to strengthen the validity and utility of this promising measurement tool. The present paper aimed to identify the ideal item and factor structure through an internet-based survey to supplement the DAS scale's validity and internal consistency.

The results of the study indicate that a seven-item two-factor solution produces good model fit. The factors were named Ability to Focus Attention (FA) and Ability of Vivid Imagination (VI). In the revised structure, the item and the subscale scores showed normal distribution with no detectable floor or ceiling effect. This suggests that the scale is sensitive to individual differences in the non-clinical population, making the scale an ideal research tool for researchers interested in normative dissociation. The subscales had good internal consistency, and convergent and divergent validity was confirmed. The factor analysis results revealed a poor model fit for the original factor structure of the DAS. After the pruning of the items with highly skewed scores and low communality, seven items were retained in the two factor structure. The new factor structure had good model fit, giving strong support for the application of this item and subscale composition in future studies.

Our results indicated that the validity of the one-factor solution, the use of a composite score for the DAS is unwarranted, and that the subscale scores should be interpreted separately. Although the use of a single normative dissociation score might be more convenient in some studies, our data do not support that the answers to the items would be manifests of a single construct. This might suggest that normative dissociation, while being a good umbrella term, refers to behaviours and experiences with several different underlying mechanisms. Furthermore, the literature indicates support of a bipartite model of dissociation, representing two categories of pathological dissociation, detachment and compartmentalization, which have different mechanisms and treatment (Brown, 2006; Holmes et al., 2005). In the perspective that dissociation lies on a continuum from pathological to non-pathological, our results support that there are different factors of normative dissociation, including attention and fantasy-proneness (Pekala et al., 2001). From escaping the mundane using vivid imagination to concentrating on a research article using focused absorption, the theory that dissociation is a coping ability would support why there are different types and mechanisms of normative dissociation that are adaptive to particular situations (de Ruiter et al., 2006; Dell & O'Neil, 2010; Fisher et al., 2013).

The reliability of the newly identified subscales was confirmed in our internet-based survey. However, improvements to the wording of scale items and internal consistency of the VI subscale are recommended. Results indicate that DAS 6 ('I can observe my behavior as if I am watching someone else') should be replaced or re-phrased in order to improve internal consistency. Also, with only seven items left in the scale (four and three in the subscales), the reliability of the scale is more sensitive to outliers. To improve stability and reliability, the scale would benefit from new items in both subscales.

Our results were primarily based on young adults, which may be a limitation to this study. Research supports that the experience of normative dissociation declines with age, levelling off after the age of 40 and that younger subjects were found to dissociate more frequently than older subjects (Ross et al., 1990; Torem et al., 1992). Administering the DES and DAS on an extended non-clinical population with a wider age range would address these limitations in subsequent studies. A second limitation of the study is that the data are based on online self-report measures. Additional performance measures that assess attention objectively would perhaps strengthen our findings. Although it was outside the scope of this current study, it is recommended in subsequent studies to incorporate measures of well-being or adaptive functioning to validate that the DAS taps into adaptive instead of pathological dissociation.

The present study has strengthened the DAS item composition and refined factor structure to measure non-clinical dissociation. Based on this study we advise the use of the DAS as a concise seven-item scale composed of two subscales. The application of the DAS can be fruitful in numerous research domains in which a sensitive measurement of normative dissociation is needed, such as studies focused on absorption and immersion, fantasy proneness, cognitive effectiveness, interrogative suggestibility, and predicting hypnotic ability (Dienes et al., 2009; Frischholz et al., 2015; Holtgraves & Stockdale, 1997; Merckelbach et al., 2000; Nadon et al., 1991; Spindler & Elklit, 2003). Most notably, the DAS may be clinically useful in predicting internet and gaming addiction due to excessive internet use being associated with higher levels of dissociative symptoms (Canan et al., 2012) and dissociative symptoms being related to severity and impact of internet addiction disorder (Bernardi & Pallanti, 2009). Future directions include refining item composition by adding new items which correspond to the amended factor structure, testing model fit in different age ranges, and additional cross-validation studies.

In conclusion, these results provide confirmatory support that the DAS is a promising brief scale to measure normative dissociation with good model fit and validity. With subsequent confirmatory research, the DAS can address the holes in normative dissociative research, providing the first scale to specifically measure non-pathological dissociative ability.

ACKNOWLEDGEMENTS

The authors would like to thank Aimee Johnson for her help in conducting the internet-based survey.

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