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Psychometric Properties of the Norwegian Acceptance and Action Questionnaire in a Non-clinical Sample

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Abstract

The Acceptance and Action Questionnaire second version (AAQ-II) is a widely used measure of experiential avoidance and has been translated into several languages. Previous examinations of the psychometric properties have shown a correlated measurement error (CME) between item 1 and 4, and in some studies also items 2 and 3. Allowing for CME in confirmatory factor analysis may introduce biases and move the results away from the true population model. The purpose of this study was (1) to examine the factor structure of the Norwegian AAQ-II (NAAQ), without allowing CME, and (2) to test the hypothesis that more experiential avoidance is related to the use of more maladaptive and less adaptive emotion regulation strategies. We recruited and assessed 233 (data set 1) and 395 (data set 2) participants with the NAAQ, and the second sample was also assessed with the Emotion Regulation Questionnaire. Our results show that five items best represented NAAQ. Further, our hypothesis about the relationship between experiential avoidance and emotion regulation strategies was supported. Experiential avoidance correlated negatively with reappraisal and positively with expression suppression. We conclude that the NAAQ is a valid measure of experiential avoidance in a non-clinical sample and that there is a juxtaposition between experiential avoidance and emotion regulation, and thus between acceptance and commitment therapy and emotion regulation theory.
Key words: AAQ-II, Confirmatory Factor Analysis, Correlated Measurement Error.

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Novelty and Significance

What is already known about the topic?

- Acceptance and Action Questionnaire-II is a widely used measure of experiential avoidance.
- It has been translated and adapted to several languages.
- It has some problems concerning its internal validity, some questions are correlated.

What this paper adds?

- A revised Acceptance and Action Questionnaire with five items may be used.
- This diminishes internal validity problems and may improve internal and external validity.

The Acceptance and Action Questionnaire-II (AAQ-II) is a construct aimed at measuring *Experiential Avoidance* (EA) or also *Psychological flexibility* (PF), a core construct in third-wave psychotherapies, among them *Action and Commitment Therapy* (ACT), *Dialectical Behavior Therapy* DBT, and *Brief Behavioral Activation Treatment for Depression* (BATD) to name some (e.g., Rochefort *et alia*, 2018). Although such core constructs have received some criticism regarding their clarity (e.g., Ruiz *et alia*, 2016), psychometric properties (e.g. Bond *et alia*, 2011), and discriminant validity

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(Rochefort *et alia*, 2018; Tyndall *et alia*, 2019), the AAQ-II has been frequently used as an assessment of EA in published studies (Rochefort *et alia*, 2018).

In order to overcome some serious limitations in the preceding AAQ (Hayes *et alia*, 2004), Bond *et alia* (2011) developed the AAQ-II. Following item generation and selection, a first study comprised 206 students replying to a 49-item trial version of the AAQ-II. A 10 item and subsequently a seven-item scale was retained. The seven-item scale was tested with confirmatory factor analysis with three different samples. All three datasets obtained good fit with Correlated Measurement Errors (CME), or method effects, between items 2 and 5, due to the fact that they contained some similar wording, i. e., "painful", "memories," and "life." Fit indices used with reviewed articles are depicted in Table 1. along with values indicating good model fit (Hu & Bentler, 1998).

Table 1. Earlier studies Fit indices change with *CME* between items 1 and 4.

Study	*CFA* Fit indices								
	NC ≤3-≤5	*RMSEA* ≤.06	*SRMR* ≤.08	*CFI* ≥.95	*TLI* ≥.95	*NNFI* ≥.95	*ECVI* <score	*NFI* ≥.95	*IRC*
Bond *et alia*, 2011	+	+	+	+	+				
Fledderus *et alia*, 2012		+	+		+				
Ruiz *et alia*, 2016	-	-		+		+/-	+/-		.20
Yavuz *et alia*, 2016*	+/-	-	-	+/-	+/-			+	
Edwards *et alia*, 2020	-	-	+	+	+				.56
Correa Fernández *et alia*, 2020**	+	-	+	+	+				
Østergaard *et alia*, 2020***	+	+/-	+/-	+	+				

Notes: *CFA*= Confirmatory Factor Analisys; *CFI*= Comparative Fit Index; *CME*= Correlated Measurement Errors; *ECVI*= Expected Cross-Validation Index; *IRC*= Item Residual Correlation; *NC*= Normed Chi-square; *NFI*= Normed Fit Index; *NNFI*= Non Normed Fit Index; *RMSEA*= Root Mean Square Error of Approximation; *SRMR*= Standardized Root Mean Square; *TLI*= Tucker-Lewis Index; += improved fit, met criteria, -= improved fit, did not meet criteria, +/-= improved fit, did meet criteria without CME-model; *= also, items 2 and 5 CME, fit data reported for items 1 and 4 CME; **= also, items 6 and 7 CME, fit data reported for item 1 and 4 CME; ***= also, item 2 and 3 CME, fit data reported for items 1 and 4 plus items 2 and 3 *CME*.

The issue of reported CME between items 2 and 5 was further tested by Fledderus *et alia* (2012), employing two models, one with the CME and one without it. The CME model overall fared better than the non-CME model. The authors concluded that the AAQ-II essentially was unidimensional. In subsequent articles, the items are numbered 1 and 4 because the scale was reduced from 10 items to seven, and items were renumbered.

Ruiz *et alia* (2016) tested a Spanish language version in Colombia with 1759 participants comprising undergraduates, general population, and a clinical sample. They also compared two models, one that allowed CME between items 1 and 4 and one that did not. Again, the model fits were better with CME, and the residual correlation between items 1 and 4 was .20.

Yavuz *et alia* (2016) tested a Turkish version with 207 participants who had at least one severe psychiatric diagnosis and 267 participants without a diagnosis. Two models were compared, one non-CME and one CME. However, their CME model comprises both items 1 and 4 CME and items 2 and 3 CME. As with previous articles, the CME model fits better.

Edwards *et alia* (2020) tested the AAQ-II among 1509 Hispanic participants and found a relatively good fit with CME between items 1 and 4, the residual correlation as high as .56.

Correa Fernández *et alia* (2020) also found CME between items 6 and 7 in addition to items 1 and 4, but reported results only for the item 1 and 4 CME model. Østergaard *et alia* (2020) tested the Norwegian translated AAQ-II, (NAAQ), and also report from the items 1 and 4 CME, which returned a better fit than non-CME.

There are, however, some issues with allowing CME in Confirmatory Factor Analysis (CFA). Some considerations and concerns have been advocated by Hermida (2015). The first problem Hermida address is that when CME is allowed based upon post-hoc modifications, good model fit statistics can be achieved "in spite of omitting relevant variables from their models" (p. 7). Even though the fit of the model is improving, understanding the cause of the CME is still wanted. A second problem with allowing post-hoc CME is that significant correlations may be due to sampling error. Allowing CME in this situation may capitalize on the specific features of the current data but moving away from the true population model again may hamper future cross-validation with new samples. A third problem discussed is that allowing CME may bias parameter estimates of the model and mask an underlying structure of modeled relationships.

Regarding the first problem, this seems to be a major issue with the AAQ-II. The CME between items 1 and 4 appears to be taken for granted, and the model fit generally improves, although marginally in many studies. For instance, in the Ruiz *et alia* (2016) study, the *Normed Chi-square* (NC) and *Root Mean Square Error of Approximation* (RMSEA) fit indices improved with CME but still did not reach the recommended values. The Comparative Fit Index (*CFI*) also improved and reached the recommended value, and the Non Normed Fit Index (*NNFI*) and the Expected Cross-Validation Index (*ECVI*) values improved but had reached the recommended value without the CME-model. A similar picture is seen in subsequent articles depicted in Table 1, but the fit indices that improve differ between studies. This picture also suggests that there may be issues with sampling error, which was the second issue discussed by Hermida (2015). The variation in fit indices improvement over studies indicates that the AAQ-II does not reliably represent a true population but rather an idiosyncratic sample.

It may also be that a relevant variable, or underlying dimension, has been omitted in the process of reducing the number of items from 10 to seven. In the Bond et alia (2011) article, they identified two distinct factors when running an Exploratory Factor Analysis (EFA) with 10. They hypothesized that this was due to a method effect stemming from positive and negative wording rather than an expression of two dimensions. Consequently, three items with positive wording were removed, and the remaining seven items returned a one-factor solution. A similar procedure was employed by Lundgren and Parling (2017) in their evaluation of the Swedish Acceptance and Action Questionnaire (SAAQ). Starting with the 10 items AAQ-II, they excluded items 1, 6 and 10, but also item seven ("Emotions cause problems in my life") that double-loaded on both dimensions. Consequently, the SAAQ comprises 6 items (number 2, 3, 4, 5, 8, and 9 from the 10-item version), with high factor loadings and communalities obtained in a different sample. Item seven also loaded on both components in the Bond *et alia* (2011) study, but negatively and weekly (-.16) on the second.

The NAAQ (Østergaard *et alia*, 2020) also retained a one-dimension model modified with CME for both items 1 and 4 plus items 2 and 3 in order to obtain a good model fit. Again, some fit indices improved and some did not with the CME-model, implicating a possibility of some dimensions not explained in the data. This again may complicate interpretations of concurrent, convergent validity, discriminant, and incremental validity (e.g., Kleszcz *et alia*, 2018; Rochefort *et alia*, 2018; Tyndall *et alia*, 2019; Østergaard *et alia*, 2020).

Emotional dysregulation is one factor associated with experiential avoidance (Schramm *et alia*, 2013). When individuals with poor emotion regulation skills experience aversive or threatening situations, unpleasant emotions rise and, instead of accepting and dealing with these emotions, avoidance or escape strategies are used (Chapman *et alia*, 2011). Consequently, experiential avoidance is part of the overarching construct of emotion regulation. Given this conceptual overlap between experiential avoidance and emotion regulation, we expect individuals scoring high on the AAQ-II to report more dysfunctional emotion regulation strategies. In the current study, we use the Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003) to assess participants' emotion regulation skills in two domains: suppression and reappraisal. We hypothesize that high scores on the AAQ-II will be associated with lower scores on reappraisal and higher scores on suppression.

The purpose of the current study is to investigate a modified version of the NAAQ in order to obtain a good model fit without CME between items. Further, we examine convergent validity by analyzing the associations between NAAQ and ERQ.

Method

Participants

We recruited participants using social media (sites and groups including >2000 members). We distributed an online questionnaire, starting with informed consent. To data set 1, 233 participants volunteered, 185 women and 48 men. To data set 2, 395 participants volunteered, 310 women and 83 men, ranging from 18 to 69 years of age (*M*= 38.47, *SD*= 12.47). The questionnaire for data set 1 included age group, gender, and all seven AAQ-II items. The questionnaire for data set 2 included actual age, gender, all seven AAQ-II items, and additionally, all 10 ERQ items.

The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its amendments. No personal data were collected, and the Norwegian Centre for Research Data does not require preapproval for this kind of data.

Data Analysis AAQ-II

Data Set 1. Data were normally distributed. Skewness and Kurtosis values were all below 1: .08 to .77 and .20 to .83, respectively. We performed a CFA with Robust Maximum Likelihood (RML) estimation method. Fit indices included absolute *NC* (χ^2/df), *RMSEA*, and *Standardized Root Mean Square Residual* (*SRMR*), incremental Comparative Fit Index (CFI), and the parsimony *Tucker-Lewis Index* (*TLI*). Recommended values for each of the fit indices are depicted in Table 2, headings. In order to improve poor fit, we analyzed *Modification Indices* (*MI*) (Hooper *et alia*, 2008; MacCallum *et alia*, 1992) and *Expected Parameter Change* (*EPC*). As expected, there was a large modification index between items 1 and 4 (*MI*= 67.10, *EPC*= .42), but also between items 3 and 4 (*MI*= 15.09, *EPC*= -.23), and 3 and 7 (*MI*= 14.71, *EPC*= .26).

Model Modification. According to the recommendations from Hooper *et alia* (2008) and MacCallum *et alia (*1992), the following procedure was employed: Items 1, 3, 4, and 7 were analyzed in terms of theory (psychological flexibility) and item wording. The sameness in wording between items 1 and 4 has been a known issue in earlier articles (e.g., Bond *et alia*, 2011; Correa Fernández *et alia*, 2020; Edwards & Vowles, 2020; Fledderus *et alia*, 2012; Ruiz *et alia*, 2016; Østergaard *et alia*, 2020; Yavuz *et alia*, 2016), i.e., both items contain "painful" and "memories." Also, items 3 and 7 both contain "worries." The high MI between items 3 and 4 is less evident in terms of theory or wording, and the EPC was also negative. Consequently, in order to test whether items 1 and 7 may be superfluous, that is —can model fit be improved without these items— they were removed for a second CFA with the same data set, again with a RML estimation method.

Data Set 2. Data were normally distributed, Skewness and Kurtosis values were all below 1: .41 to .95 and .20 to .62, respectively. In accordance with MacCallum *et alia* (1992), we repeated the procedures employed for dataset 1, but now with a new and dataset not related to dataset 1. Specifically, the recommendation from MacCallum e*t alia* (1992) reads: "… cross-validation of a model resulting from a specification search should involve parallel searches conducted on independent samples. That is, the initial model should be fit to both samples, and the model modification process should be conducted in both samples" (p. 492).

Factor Analysis and Model Modification. We performed a CFA with *Robust Maximum Likelihood* (*RML*) estimation. Fit indices were the same as for dataset 1, and recommended values are depicted in Table 2, headings. In order to improve poor fit, we analyzed modification indices (Hooper *et alia*, 2008; MacCallum *et alia*, 1992). As expected, there was a large *MI* between items 1 and 4 (*MI*= 85.82, *EPC*= .43), but also between items 6 and 7 (*MI*= 46.23, *EPC*= .37), and items 2 and 3 (*MI*= 18.91, *EPC*= .23). In order to repeat the dataset 1 item deletion and thus test whether items 1 and 7 also may be superfluous for data set 2, they were removed for a second CFA, again with a *RML* estimation method.

Data Analysis ERQ

Data Set 2. Data were normally distributed. Skewness and Kurtosis values were all below ±2: -.65 to 1.45 and -1.06 to .1.51, respectively. Consequently, we employed the *RML* estimation method.

Factor Analysis and Model Modification. Fit indices were the same as for the AAQ-II data, and recommended values are depicted in Table 2, headings. Again, in order to improve poor fit, we analyzed modification indices (Hooper *et alia*, 2008; MacCallum *et alia*, 1992). There was a large *MI* between items 1 and 3 (*MI*= 40.79, *EPC*= .37), between 3 and 8 (*MI*= 21.24, *EPC*= -.26), and also between items 1 and 10 (*MI*= 15.07, *EPC*= -.20). We hypothesized that items 3 and 10 might be superfluous, and they were removed for a second CFA, again with a *RML* estimation method.

Results

AAQ-II Fit indices for the modified models (items 2-6) for data sets 1 and 2 are depicted in Table 2. For data set 1, the *NC* improvement is within a permissible value, <5, although not within recommended (<3). This is also the case for the *RMSEA*, a value of .10 indicates moderate fit. The SRMR value improved but also was within the recommended value with the seven-item scale. The CFI and *TLI* improved to above the recommended value of .95. For data set 2, the NC improved to be within the recommended value. The *RMSEA* was also within the recommended values but for the upper 90 % CI value above the recommended value of .08. The *SRMR* value improved but also was within the recommended value with the seven-item scale. The CFI and TLI improved to above the recommended value of .95.

Table 2. Model Fit indices values before and after model modification for datasets 1 and 2.

SScale	Data set	*CFA* Fit indices				
		NC ≤3-≤5	*RMSEA* ≤06 [≈0, <.08]*	*SRMR* ≤.08	*CFI* ≥.95	*TLI* ≥.95
AAQ-II	1, items 1-7 (all)	8.08	.17 [.15, .21]	.04	.92	.88
AAQ-II	1, items 2-6	3.26	.10 [.05, .15]	.03	.98	.97
AAQ-II	2, items 1-7 (all)	8.11	.15 [.13, .17]	.05	.93	.89
AAQ-II	2, items 2-6	2.24	.06 [.01, .10]	.02	.99	.99
ERQ	2, items 1-10 (all)	4.12	.09 [.07, .10]	.05	.91	.87
ERQ	2, removed items 3 and 10	1.44	.03 [.00, .06]	.04	.99	.98

*Note: *= 90% CI.*

Table 3. AAQ-II CFA factor loadings and reliability measures.

Data set 1	Factor loadings		7 item scale reliability			5 item scale reliability		
	7 items	5 items	α [95% *CI*]	α if *ID*	*CI-TC*	α [95% *CI*]	α if *ID*	*CI-TC*
AAA1	.85		.93 [.91, .94]	.92	.80			
AAQ2	.76	.77		.92	.72	.90 [.88, .92]	.89	.72
AAQ3	.80	.82		.92	.79		.88	.77
AAQ4	.88	.82		.91	.83		.88	.77
AAQ5	.82	.85		.92	.80		.87	.80
AAQ6	.77	.78		.92	.75		.89	.73
AAQ7	.78			.92	.75			
Data set 2	Factor loadings		7 item scale reliability			5 item scale reliability		
	7 items	5 items	α [95% *CI*]	α if *ID*	*CI-C*	α [95% CI]	α if *ID*	*CI-C*
AAA1	.78		.91 [.89, .92]	.90	.72			
AAQ2	.73	.75		.90	.70	.87 [.85, .89]	.85	.70
AAQ3	.74	.79		.90	.71		.84	.72
AAQ4	.80	.75		.89	.75		.85	.69
AAQ5	.79	.80		.89	.75		.84	.73
AAQ6	.74	.71		.90	.70		.86	.66
AAQ7	.78			.89	.75			

Standardized factor loadings for the non-modified (items 1-7) and modified models (items 2-6) for data sets 1 and 2 are depicted in Table 3. Although some differences can be detected, there are no substantial differences for either data set. The same picture can be seen with internal consistency and other reliability measures. Although some differences can be detected, the overall picture is that the five-item scale performs close to the seven-item scale for both data sets.

ERQ Fit indices for the non-modified and modified models (items 3 and 10 deleted) for data set 2 are depicted in Table 2, ERQ. The *NC* and the RMSEA improved to be within the recommended values. The *SRMR* value improved but also was within the recommended value with the seven-item scale. The CFI and *TLI* improved to above the recommended value of .95.

Standardized factor loadings for the non-modified (10 items) and modified model (8 items) for data set 2 are depicted in Table 4. Although some differences can be detected, there are no substantial differences for either data set. The same picture can be seen with internal consistency and other reliability measures. Although some differences can be detected, the overall picture is that the five-item scale performs close to the seven-item scale for both data sets.

The AAQ-II five item scale and the four items ERQ subscales Cognitive Reappraisal (CR) and Expression Suppression (ES) were all normally distributed. The AAQ-II and ERQ-CR correlated moderately negatively (r= -.29, *CI*95%[-.38, -.20], p <.001), and the AAQ-II and ERQ-ES correlated moderately positively (r= -.24, *CI*95%[-.15, -.33], p <.001). The ERQ-CR and ERQ-ES did not correlate. (r= -.03, *CI*95%[-.12, .07], p <.622).

Table 4. ERQ CFA factor loadings and reliability measures.

	Factor loadings		10 item scale reliability			8 item scale reliability		
Data set 2	10 items	8 items	α	α if *ID*	*CI-C*	α	α if *ID*	*CI-C*
Reappraisal			.83			.73		
ERQ1	.61	.58		.81	.55		.69	.47
ERQ3	.67			.80	.62			
ERQ5	.52	.45		.84	.46		.75	.40
ERQ7	.75	.86		.79	.67		.59	.67
ERQ8	.73	.70		.80	.62		.63	.58
ERQ10	.77			.78	.70			
Suppression			.73					
ERQ2	.80	.80		.61	.63			
ERQ4	.38	.38		.77	.33			
ERQ6	.70	.70		.64	.58			
ERQ9	.69	.69		.65	.56			

Discussion

The purpose of the current study was to investigate a modified version of the NAAQ to obtain a good model fit without CME between items. Modifications of data sets 1 and 2 show that this was obtained. A five-item version of the NAAQ did show good model fit on 4 out of five indices, with the fifth index showing acceptable fit. Furthermore, there was good reliability on both occasions. This indicates that a one-factor model can be applied without employing CME to obtain good fit, using items 2, 3, 4, 5, and 6 only.

The results support our hypothesis about the relationship between experiential avoidance and emotion regulation. Higher scores on suppression and lower scores on reappraisal as emotion regulation strategies were associated with higher scores on NAAQ. Thus, our results suggest that when experiencing aversive situations and unpleasant emotions, individuals high in experiential avoidance tend to suppress emotional expressions and use reappraisal to a lesser extent than individuals low on experiential avoidance. The overlap between experiential avoidance and emotion regulation has important clinical implications. Patients high in experiential avoidance may benefit from emotion regulation training. Furthermore, Acceptance and Commitment Therapy (ACT) may improve patients' emotion regulation skills (e.g., Hayes *et alia*, 2004). Our correlational design prevents us from disentangling the causal direction of the observed associations, but in clinical practice, experiential avoidance is an important factor to consider both in emotion regulation therapy and ACT.

We included 233 and 395 participants in our study, but we did not collect extensive demographic information about our participants. Thus, we do not know their ethnicity, socioeconomic background, or educational level. Further, no assessment of mental health difficulties was carried out. We assume that our variables, experiential avoidance and emotion regulation, are distributed evenly across possible participants and that demographic variables would have little impact on the factor structure of the NAAQ and the association between NAAQ and ERQ. However, the lack of mental health assessment is a limitation, and further studies should examine how this variable affects the relationship between experiential avoidance and emotion regulation.

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