Journal of Anxiety Disorders 54 (2018) 65–70

Contents lists available at ScienceDirect

Journal of Anxiety Disorders

journal homepage: www.elsevier.com/locate/janxdis

An empirical assessment of adjustment disorder as proposed for ICD-11 in a general population sample of Israel

Louisa Lorenz[a,*], Philip Hyland[b], Andreas Maercker[a], Menachem Ben-Ezra[c]

[a] Department of Psychology, University of Zurich, Zurich, Binzmuehlestr. 14/17, 8050, Zurich, Switzerland
[b] School of Business, National College of Ireland, Dublin, Mayor Street, IFSC, Dublin 1, D01 Y300, Ireland
[c] School of Social Work, Ariel University, Ariel Science Park, Ariel, 40700, Israel

ARTICLE INFO

Keywords:
Adjustment disorder
ICD-11
Bifactor model
Confirmatory factor analysis (CFA)
Latent class analysis

ABSTRACT

Background: A new diagnostic concept of Adjustment Disorder (AjD) was proposed for inclusion in the International Classification of Diseases, 11th version (ICD-11). However, the symptom structure of AjD is poorly understood. The aim of the present study was to investigate the dimensionality of AjD as a stress-response syndrome.

Methods: A general population sample of the Israeli population (N = 1003) completed the Adjustment Disorder – New Module 20 and the WHO-5 Wellbeing Scale. We compared seven alternative models of AjD using confirmatory factor analysis (CFA). A latent profile analysis (LPA) was performed to determine if subtypes of AjD were present. The performance of the unidimensional and multidimensional models of AjD were evaluated using regression analyses.

Results: CFA results supported a unidimensional model of AjD. The LPA identified three quantitatively distinct classes (low, medium, and high) with no evidence of any subtypes of AjD. The criterion validity of AjD was superior when treated as unidimensional. AjD was associated with lower levels of psychological wellbeing ($\beta = -.32$, $p < .001$).

Conclusions: Our results suggest that AjD is better conceptualised as a unidimensional construct. Future work should focus on a reduction of required symptoms in order to improve clinical utility and validity of the diagnosis.

1. Introduction

In recent years, the adjustment disorder (AjD) diagnosis received increased attention because of its status as a subordinate diagnosis in the International Classification of Diseases (ICD) manual published by the World Health Organization (WHO) (Casey & Strain, 2016). AjD is currently defined as the development of emotional and behavioural symptoms in response to a critical life event or external life stressor, usually emerging within one month after the onset of the stressor and resolving within six months after the event or its consequences have been terminated (World Health Organization, 1992). The symptoms that occur are of a type found in many affective, neurotic, stress-related, somatoform, or conduct disorders, but do not meet the quantity or quality of the diagnostic criteria of an individual disorder (World Health Organization, 1992). The clinical picture is specified by subtypes of unique and mixed features of depressive symptoms, anxiety reactions, and impulse control problems (World Health Organization, 1992). The Diagnostic and Statistical Manual for Mental Disorder in its 4th and 5th version (DSM-IV, American Psychiatric Association, 1994; DSM-5, American Psychiatric Association, 2013) uses a similar definition of AjD, characterised by symptoms that lead to marked distress or significant impairment without meeting full diagnostic threshold for another psychiatric disorder. Criticism towards AjD has been raised because of the poor symptom definition that results in a lack of specificity, reliability, and validity of the diagnosis (e.g., Strain & Diefenbacher, 2008). Furthermore, the distinction of subtypes has rarely been investigated and evidence for their validity is sparse (Casey & Bailey, 2011).

The diagnostic category of AjD underwent considerable revisions in preparation for ICD-11. The current proposal incorporates for the first time a specific symptom definition based on the stress-response conceptualisation by Horowitz (2001). Symptoms reflecting 'Preoccupation

Abbreviations: AjD, Adjustment Disorder; ICD-11, International Classification of Diseases, 11th revision; WHO, World Health Organization; PRE, Preoccupation with the stressor or its consequences; FTA, Failure to adapt; CFA, Confirmatory Factor Analysis; CBM, Confirmatory Bifactor Modelling; LCA, Latent Class Analysis; LPA, Latent Profile Analysis

* Corresponding author.
E-mail addresses: l.lorenz@psychologie.uzh.ch (L. Lorenz), Philip.Hyland@ncirl.ie (P. Hyland), maercker@psychologie.uzh.ch (A. Maercker), menbe@ariel.ac.il (M. Ben-Ezra).

https://doi.org/10.1016/j.janxdis.2018.01.007
Received 30 August 2017; Received in revised form 24 January 2018; Accepted 26 January 2018
Available online 07 February 2018
0887-6185/

with the stressor or its consequences' (PRE) and 'Failure to adapt' (FTA) are defined as 'core symptoms' of AjD (Maercker et al., 2013). PRE includes excessive worry, recurrent and distressing thoughts, and constant rumination about the stressor or its implications; and FTA incorporates symptoms of a generalized stress response, such as sleep disturbances or concentration problems, interfering with everyday functioning (Maercker et al., 2013). The new proposal also includes a criterion of significant impairment in personal, family, social, educational, occupational, or other areas of functioning (Keeley et al., 2016). The distinction of subtypes has been omitted, however depressive symptoms, anxiety reactions, and conduct problems are referred to as "commonly present" (Maercker et al., 2013, p. 202). The initial proposal also included avoidance as core symptom (Maercker, Einsle, & Köllner, 2007) but was dropped during the ICD-11 revision process. Current studies label depression, anxiety, impulsivity, and avoidance as 'accessory symptoms' of AjD (e.g., Zelviene, Kazlauskas, Eimontas, & Maercker, 2017, p. 21).

To date, there is a lack of clarity regarding the symptom structure for AjD, and consequently, the appropriate diagnostic criteria that should be employed. The existing data provides conflicting evidence of both unidimensionality and multidimensionality of the construct. Previous studies that have assessed the latent structure of AjD symptoms have suggested a correlated six-factor solution that included PRE, FTA, avoidance, depression, anxiety, and impulsivity (Einsle, Köllner, Dannemann, & Maercker, 2010; Glaesmer et al., 2015; Zelviene et al., 2017). In all studies, the factors were highly correlated pointing towards the possibility of a unidimensional structure. Glaesmer et al. (2015) assessed the plausibility of a unidimensional solution by comparing the correlated six-factor model to a single factor model, and a second-order model in which the correlations between the first-order factors were explained by a single second-order factor. Both unidimensional models provided reasonable fit, and were equivalent to the correlated six-factor model. Given the similar model fit results, the lack of distinguishability between the latent factors in the correlated model, and the increased parsimony associated with the single-factor model, Glaesmer et al. (2015) favoured the unidimensional model of AjD symptoms. Lorenz, Hyland, Perkonigg, & Maercker (2017) applied confirmatory bifactor modelling (CBM; Reise, 2012) within a convenience sample of individuals affected by involuntary job loss in Switzerland in order to better understand the structure of AjD symptoms. CBM is advantageous in that it allows unidimensionality and multidimensionality to be modelled simultaneously to determine the dominant source of covariation (Reise, 2012). The authors reported that a bifactor model comprised of a dominant 'general' factor (AjD), and five correlated 'group' factors (PRE, FTA, avoidance, affective reaction [aggregation of the depression and anxiety factors], and impulsivity) provided superior fit to the data than six other tested models. The results indicated that the majority of symptom covariation was due to the general factor and consequently AjD was most accurately described as a unidimensional construct.

In addition to the uncertainty regarding the symptom structure of AjD, there is scant evidence regarding the empirical status of possible subtypes of AjD (cf. Casey & Bailey, 2011). A common method for identifying homogenous subgroups within multivariate data is through the application of mixture-modelling techniques (e.g., latent class analysis [LCA] or latent profile analysis [LPA]). We are aware of only two studies that have applied this analytical strategy to assess the presence of discrete subgroups based on response patterns to AjD symptoms. Among a nationally representative sample of the German population, Glaesmer et al. (2015) used LPA and identified three classes (a low symptom class, a mild symptom class, and a moderate symptom class). For the DSM-5 concept, O'Donnell et al. (2016) also identified three classes (low-, medium-, and high-symptom classes) among individuals that experienced severe injuries. These results indicate that individuals were distributed in a quantitative manner along a single latent dimension of AjD and are thus consistent with a unidimensional representation of AjD.

Given the upcoming release of the ICD-11, it is important that additional empirical work is undertaken to determine the most accurate dimensional representation of AjD. We sought to advance this research in a number of novel ways using a sample from the adult Jewish population of Israel. There were three aims of this study. First, the latent symptom structure of AjD was investigated using confirmatory factor analysis (CFA), and CBM, in order to test whether AjD is best represented as a unidimensional or multidimensional construct. Second, we sought to determine if unique latent classes could be identified based on responses to the AjD symptoms through the application of LPA techniques. Third, multiple regression analyses were used to investigate the criterion validity of AjD by determining how well AjD predicts psychological wellbeing when conceptualised as a unidimensional construct or as a multidimensional construct.

We believe there was insufficient evidence to formulate specific hypotheses. However, under the assumption that AjD is most optimally conceived as a unidimensional construct, the following pattern of results would be expected: Factor analytic results should favour (1) a single-factor unidimensional model, (2) a second-order model with a single latent variable that accounts for the covariation between the first-order factors, or (3) a bifactor model with a dominant general factor. The LPA results should reveal a number of *quantitatively* differing latent classes (e.g., low-, moderate-, and high-symptom classes). The multiple regression results should yield more robust predictive effects when AjD is conceptualised as a unidimensional construct than as a multidimensional construct. Alternatively, if AjD was more accurately represented as a multidimensional construct, the following pattern of results would be expected: Factor analytic results should favour (1) a multidimensional first-order solution, or (2) a bifactor model with multiple dominant group factors. The LPA results should reveal a number of *qualitatively* differing latent classes (e.g., one class that is distinguished by low levels of depression and high levels of impulsivity, and, another class distinguished by high levels of avoidance and low levels of PRE). The multiple regression results should provide more robust predictive effects when AjD is conceptualised as a multidimensional construct than as a unidimensional construct.

2. Material and methods

2.1. Participants

The sample for the present analysis consisted of $N = 1003$ Israeli participants that were recruited as part of a study investigating the ICD-11 stress-response syndrome spectrum (posttraumatic stress disorder, complex posttraumatic stress disorder, prolonged grief disorder, adjustment disorder). The sample was drawn from a national panel of 130,000 Israelis using stratified and random sampling methods in order to address a sample that is a close approximation to the adult Jewish population of Israel. They were approached via internet through iPanel (2015) and the response rate was 31%. There were slightly more female participants ($n = 519$, 51.7%) than male. The mean age was 40.6 years ($SD = 14.5$), with a range from 18 to 70 years. The majority of participants ($n = 707$, 70.5%) were in a committed relationship at the time of assessment and 82.7% ($n = 830$) were employed either part- or full-time. The highest level of education was obligatory school for 2.1% (n = 21), secondary school for 29.1% (n = 292), and education on tertiary level for 68.4% (n = 686). Most of the participants (n = 825, 82.3%) indicated as living in an urban neighbourhood and 27.4% (n = 275) emigrated to another country once in their life.

2.2. Measures

AjD symptoms were assessed by the *Adjustment Disorder – New Module 20* (ADNM-20; Einsle et al., 2010). The ADNM-20 consists of a stressor list and a symptom list. On the stressor list, the participants

were asked to indicate all stressful life events that they had experienced in the past two years with month and year of occurrence, and to indicate the most straining event. The symptom list then measured all AjD symptoms with regard to the indicated event. It consists of 19 symptom items plus 1 item that measures functional impairment. The response format was a 4-point Likert scale ranging from 1 (*'never'*) to 4 (*'often'*). Glaesmer et al. (2015) proposed a diagnostic algorithm to identify individuals at high risk for AjD: At least one item rated ≥ 3 and at least two items rated ≥ 2 on each core symptom scale (PRE, FTA) plus endorsement of the item measuring functional impairment ≥ 3. The ADNM-20 showed satisfactory results regarding internal consistency, retest-reliability, and discriminant and convergent validity in previous studies (Bley, Einsle, Maercker, Weidner, & Joraschky, 2008; Dannemann et al., 2010). The internal consistency in the present study was α = 0.94. The English and the Hebrew version of questionnaire are provided in the supplementary materials.

Subjective well-being was assessed by the *5-Item World Health Organization Well-Being Index* (WHO-5; World Health Organisation, 1998). The short rating scale consists of five positively phrased items asking for different well-being parameters in the past 14 days, and were answered on a 6-point Likert scale ranging from 0 (*'none of the time'*) to 5 (*'all of the time'*). A recent systematic review summarized findings on the WHO-5 in different languages. Overall, the WHO-5 showed clinimetric validity, concurrent and discriminant validity, and predictive validity (Topp, Østergaard, Søndergaard, & Bech, 2015). The internal consistency in the present study was α = 0.94.

2.3. Statistical analysis

The statistical analyses for the current study involved three elements. The latent structure of AjD symptoms was investigated using CFA and CBM. In total, seven alternative models of the ADNM-20 were evaluated. These included four first-order correlated factor models, one second-order factor model, and two bifactor models (cf. supplementary material for graphical illustration of the models).

First-order factor models: Model 1 represented a single factor solution in which all 19 items loaded on a single factor (adjustment disorder). In *Model 2*, we distinguished between a *core symptom* factor (7 items: PRE and FTA) and an *accessory symptom* factor (12 items: avoidance, depression, anxiety, and impulsivity). *Model 3* represented a six-factor solution with each symptom group as a separate factor (PRE, FTA, avoidance, depression, anxiety, and impulsivity). *Model 4* defined the same factors as Model 3 but combined depression and anxiety into a single affective reaction factor.

Second-order factor model: Model 5 specified one second-order factor (AjD) in order to explain the factor correlations between the first-order factors as specified by the best fitting first-order model.

Bifactor models: Model 6 represented an unrestricted bifactor model (correlated general factors) that included one general factor (AjD) in addition to the factors identified by the best fitting first-order model. *Model 7* was a restricted variation of Model 6, in which the group factors were uncorrelated.

We used the robust weighted least squares, mean- and variance-adjusted estimator (WLSMV) for model estimation and specified that the items were ordered-categorical. We followed standard recommendations for assessing model fit (Hu & Bentler, 1999) and we defined acceptable model fit as follows: a chi-square to degree of freedom ratio (χ^2:df) of less than 3:1 (Kline, 2005); Comparative Fit Index (CFI; Bentler, 1990) > 0.90; Tucker-Lewis Index (TLI; Tucker & Lewis, 1973) > 0.90; Root-Mean Square Error of Approximation with 90% confidence intervals (RMSEA 90% CI; Steiger, 1990) < 0.08.

In order to identify specific subgroups, we performed a LPA for the 19 symptom indicators. In the first step, we estimated five models (a 2-class model through to a 6-class model) using robust maximum likelihood estimation (Yuan & Bentler, 2000), with 500 random sets of starting values, and 50 final stage optimizations. The relative fit of the models was compared by different information criteria: the Akaike Information Criterion (AIC; Akaike, 1987), the Bayesian Information Criterion (BIC; Schwartz, 1978), and the sample size adjusted BIC (Sclove, 1987). The model that produces the lowest values can be judged as best model. Likewise, we looked at the Lo-Mendell-Rubin adjusted likelihood ratio test (LMRA-LRT; Lo, Mendell, & Rubin, 2001), in which a non-significant *p*-value indicates that the model with one less class should be accepted.

To assess how effective AjD predicts psychological wellbeing, standard multiple regression analyses were conducted. In the first instance, AjD was treated as a unidimensional construct and a single summed score was entered into the model. In the second instance, AjD was treated as a multidimensional construct and multiple summed subscale scores (e.g., PRE, FTA etc.) were entered into the model. In both cases, we simultaneously controlled for sex (0 = male, 1 = female), age, relationship status (0 = not in a relationship, 1 = in a relationship), unemployment status (0 = employed, 1 = not employed), urbanity (0 = non-urban residence, 1 = urban residence), and emigration status (0 = never emigrated, 1 = emigrated).

We used Mplus, Version 7.4 (Muthén & Muthén, 2013) and IBM SPSS Statistics, Version 23 for statistical analyses of the data.

3. Results

Each participant indicated one most stressful life event on the ADNM-20 events list. Death of a loved one (n = 476, 47.5%), moving to a new home (n = 379, 37.8%), and illness of a loved one (n = 363, 36.2%) were the most prevalent critical life events. The majority of participants indicated the death of a loved one (n = 216, 21.5%), illness of a loved one (n = 118, 11.8%), or financial problems (n = 113, 11.3%) as most straining event. Participant mean scores on the ADNM-20 measure were $M = 39.4$ ($SD = 14.2$), with women ($M = 41.5$, $SD = 14.2$) scoring slightly higher than men ($M = 37.1$, $SD = 13.9$; $t(1001) = -4.416$, $p < .001$, $d = 0.31$). According to a diagnostic algorithm (Glaesmer et al., 2015), 17.5% (n = 175) of the sample met the criteria for a tentative diagnosis of AjD (women: 18.9%; men: 15.9%). Mean scores on psychological wellbeing was $M = 13.9$ ($SD = 6.2$), with women ($M = 14.3$, $SD = 5.8$) reporting slightly higher subjective wellbeing than men ($M = 13.5$, $SD = 6.7$; $t(1001) = -2.160$, $p < .05$, $d = 0.12$).

3.1. Confirmatory factor analysis

The results of the CFA can be found in Table 1. Of the seven models tested, just two models converged normally and without any

Table 1
Fit indices for alternative models of the structure of adjustment disorder (n = 1003).

Model	χ^2	df	CFI	TLI	RMSEA (95% CI)
First-order factor models					
1	1940.407	152	0.945	0.938	0.108 (0.104–0.113)
2	1895.643	151	0.946	0.939	0.107 (0.103–0.112)
3	–				
4	1309.991	142	0.964	0.957	0.091 (0.086–0.095)
Second-order factor model					
5	1348.141	147	0.963	0.957	0.090 (0.086 –0.095)
Unrestricted bifactor model					
6	–				
Restricted bifactor model					
7	–				

Note. All χ^2 statistics were significant. CFI = Comparative Fit Index; TLI = Tucker-Lewis-Index; RMSEA = Root-Mean Square Error of Approximation; Model 3 rejected due to a correlation greater than 1 between Depression and FTA; Model 5 included a negative residual variance related to the loading of the first-order Affective Reaction factor onto the second order AjD factor; Model 6 rejected due to correlations greater than 1 between Affective Reaction and PRE and FTA; Model 7 could not be identified.

identification problems (Models 1 and 2). Models 3, 6, and 7 were deemed inadmissible due to serious identification problems. In the case of Model 3, a correlation greater than one was present between the depression and FTA factors. Similarly, in the case of Model 6, correlations greater than one were present between the affective reaction factor and both the PRE and FTA factors respectively. In the case of Model 7, the standard errors could not be computed and thus the model could not be identified due to a problem with the affective reaction factor.

Models 4 and 5 also evidenced identification problems that present concerns regarding the interpretability of these solutions. Model 4 included a correlation of 0.996 between the affective reaction and FTA factors. In the case of Model 5, the first-order affective reaction factor loaded onto the second-order AjD factor above a value one (1.02). Joreskog (1999) demonstrated that standardized factor loadings may exceed one without implying model non-identification, particularly if the associated residual variances are positive. In this case, the residual variance of the affective reaction factor was negative, which undermines the interpretability of this solution and suggests that the model included too many factors (Muthén, 2007).

Models 1 and 2, which converged normally, evidenced acceptable model fit based on the CFI and TLI results, and poor model fit based on the RMSEA results. A chi-square difference test using the 'difftest' function in Mplus indicated that the two-factor model was significantly better than the one-factor model ($\chi^2 = 47.943$, $df = 1$, $p < .001$). Despite its statistical superiority, the correlation between the 'Core' and 'Accessory' factors was extremely high ($r = 0.97$), which severely limits the interpretability of this two-factor solution. Accordingly, based on the identification problems associated with Models 3, 4, 5, 6, and 7, and the exceptionally high correlation between the two factors within Model 2, it is argued that on the grounds of parsimony, statistical interpretability, and theoretical consistency Model 1 is the most viable solution to the structure of the ADNM-20 within the current sample.

The model parameters of Model 1 were satisfactory with the 19 items loading positively and significantly ($p < .001$) on the AjD factor. All factor loadings were of a robust magnitude, ranging from 0.47 to 0.87 (mean factor loading = 0.76; cf. supplementary materials for factor loadings).

3.2. Latent profile analysis

The fit statistics for the LPA analysis of the 19 symptom indicators are reported in Table 2. The AIC, BIC, and ssaBIC were smallest for a solution with six classes, however the decrease in each of these values began to reduce considerably after the 3-class solution. The LMRA-LRT was non-significant for the 4-class model, suggesting the superiority of the 3-class model. Based on the observed pattern of results, and with consideration to issues of parsimony and model interpretability, the 3-class solution was deemed the best fitting solution. The profile plot for the 3-class solution indicated that Class 1 (43.5%) was characterised by relatively low mean scores, Class 2 (35.1%) was characterised by moderate mean scores, and Class 3 (21.5%) was characterised by high mean scores. A quantitative distribution of AjD classes was thus evidenced by the results of the LPA.

Table 2
Fit statistics for LPA of 19 ADNM items and 5 ADNM symptom groups (n = 1003).

Classes	Loglikelihood	AIC	BIC	ssaBIC	Entropy	LMRA-LRT (p)
2	−23310	46736	47021	46837	0.96	7665 (0.000)
3	**−22263**	**44683**	**45066**	**44818**	**.93**	**2078 (.000)**
4	−21928	44052	44533	44222	0.90	666 (0.094)
5	−21753	43742	44321	43947	0.89	347 (0.193)
6	−21579	43434	44112	43673	0.89	345 (0.288)

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; ssaBIC = sample-size adjusted BIC; LMRA-LRT = Lo-Mendell-Rubin adjusted likelihood ratio test; BSLRT = Bootstrapped LRT. Selected class solution in bold.

Table 3
Multiple linear regression results predicting psychological wellbeing with AjD as a unidimensional score (n = 1003).

	R^2	β (95% CI)	p
Model	0.14		< 0.001
Sex		0.10 (0.04, 0.16)	0.001
Age		0.13 (0.07, 0.19)	< 0.001
Relationship Status		0.06 (0.00, 0.12)	0.044
Unemployment		0.00 (−0.05, 0.06)	0.888
Urbanicity		−0.06 (−0.12, −0.00)	0.042
Emigration Status		−0.06 (−0.12, −0.00)	0.037
Adjustment Disorder		−0.32 (−0.38, −0.26)	< 0.001

Note: R^2 = % Variance explained in psychological wellbeing; β (95% CI) = standardized beta value with 95% confidence intervals; p = statistical significance.

3.3. Multiple regression

The relative predictive effects of AjD when treated as a unidimensional or multidimensional were assessed via two multiple regression analyses (see Tables 3 and 4, respectively). In the first analysis, AjD as unidimensional construct was entered along with six covariates (sex, age, relationship status, unemployment status, urbanicity, and emigration status). The model explained 14.1% of variance in psychological wellbeing scores ($F(7, 995) = 23.359$, $p < .001$). Increased levels of AjD significantly predicted lower levels of psychological wellbeing ($\beta = -0.32$, $p < .001$).

As a comparison, we conceptualised AjD as multidimensional construct and entered it along with the same six covariates into the multiple regression analysis. Model 4 yielded the best fit statistics of the multidimensional models (despite the correlation close to 1 between two of the factors) and was thus chosen as multidimensional conceptualisation of AjD. In this model, 19.0% of variance in psychological wellbeing ($F(11, 991) = 21.163$, $p < 0.001$) was explained. FTA ($\beta = -0.31$, $p < 0.001$), affective reaction ($\beta = -0.17$, $p = .001$), and impulsivity ($\beta = -0.12$, $p = .031$) were negatively associated with psychological wellbeing, while PRE ($\beta = 0.18$, $p < 0.001$) and avoidance ($\beta = 0.08$, $p < 0.001$) were positively associated with psychological wellbeing. This inconsistent pattern of associations is likely the result of high levels of multicollinearity between the subscales of the ADMN-20. Tolerance statistics ranged from 0.28 (Impulsivity) to 0.53 (Avoidance), and VIF statistics ranged from 3.63 (Impulsivity) to 1.89 (Avoidance). The regression results provide greater interpretability when AjD was conceptualised as a unidimensional construct.

Table 4
Multiple linear regression results predicting psychological wellbeing with AjD as a multidimensional score (n = 1003).

	R^2	β (95% CI)	p
Model	0.19		< 0.001
Sex		0.08 (0.02, 0.14)	0.008
Age		0.10 (0.04, 0.16)	0.001
Relationship Status		0.05 (−0.00, 0.11)	0.067
Unemployment		0.01 (−0.05, 0.07)	0.741
Urbanism		−0.07 (−0.12, −0.01)	0.021
Emigration Status		−0.06 (−0.12, −0.00)	0.045
Preoccupations		0.18 (0.08, 0.27)	< 0.001
Failure to Adapt		−0.31 (−0.41, −0.21)	< 0.001
Avoidance		0.08 (0.00, 0.15)	0.050
Affective Reaction		−0.17 (−0.27, −0.07)	0.001
Impulsivity		−0.12 (−0.22, −0.01)	0.031

Note: R^2 = % Variance explained in psychological wellbeing; β (95% CI) = standardized beta value with 95% confidence intervals; p = statistical significance.

4. Discussion

The primary aim of the present study was to investigate whether AjD is best conceptualised as a unidimensional or multidimensional construct. Taken in their totality, the extant results support a unidimensional conceptualization of AjD: The only viable solution to the latent structure of the AjD symptoms, based on the factor analytic findings, was a unidimensional representation; the LPA results revealed a three-class solution with quantitatively differing latent classes (a result that is consistent with a unidimensional conceptualization of AjD); and the multiple regression treating AjD as unidimensional provided clearer and more robust findings than the multiple regression treating AjD as multidimensional, which ran into problems with multicollinearity and produced contradictory results.

The unidimensional and multidimensional nature of AjD symptoms was assessed in accordance with earlier research (Glaesmer et al., 2015; Lorenz et al., 2017; Zelviene et al., 2017). Prior research has generally supported alternative models that represent unidimensionality, either through a single factor first-order model or a single factor second-order model (Glaesmer et al., 2015), or a bifactor model with a dominant general factor (Lorenz et al., 2017). The factor analytic findings of the current study were noteworthy for several reasons. First, the only viable solution to the latent structure of the AjD symptoms was a unidmensional first-order model. Second, all other models that incorporated a unidimensional component could not be identified due to problems associated with the factors of the 'accessory symptoms'. Third, and relatedly, of the five models that evidenced identification problems, these issues were all related to the accessory symptoms of AjD. Fourth, in Model 2, which included two factors representing the 'core' and 'accessory' symptoms, respectively, the correlation between these factors was extremely close to 1 ($r = 0.97$). Considered together, these findings suggest that the inclusion of the accessory symptoms are unnecessary as they are essentially indistinguishable from the core symptoms, and their inclusion leads to a needlessly complex symptom profile whose underlying latent structure is challenging to appropriately understand.

The conclusion that the accessory symptoms are unnecessary is supported by the results of the LPA analysis. The accessory symptoms of avoidance, anxiety, depression, and impulsivity were included in the original descriptions of AjD, under the assumption that distinct subtypes of AjD existed (World Health Organization, 1992; American Psychiatric Association, 1980). However, reviews of the existing literature (Casey & Bailey, 2011) found no evidence that subtypes exist, while current results, in addition to two other studies that also applied mixture-modelling techniques (Glaesmer et al., 2015; O'Donnell et al., 2016), were consistent in their findings that AjD is simply distributed in a quantitative manner and no qualitative subtypes can be identified. In addition to the empirical data undermining the validity of the existence of any subtypes of AjD, the ICD-11 taxonomic structure explicitly rejects the use of subtypes for disorders (First, Reed, Hyman, & Saxena, 2015). From an empirical and taxonomic perspective, it would appear that the rationale for the inclusion of the accessory AjD symptoms has been invalidated.

Future application of the ADNM-20 questionnaire should allow the assessment of the diagnostic profile of a person in order to facilitate decisions about clinical diagnosis. Accordingly, past studies applied a diagnostic algorithm that solely referred to the core symptoms and functional impairment (e.g., Bachem, Perkonigg, Stein, & Maercker, 2016; Glaesmer et al., 2015). The current assessment of the latent structure of AjD symptoms provides stronger evidence for unidimensionality than multidimensionality, and favours a solution without subtypes of AjD. Furthermore, the previous classification of AjD by subtypes ran into problems of comorbidity, especially with depressive disorders (Casey et al., 2006; Casey, Dowrick, & Wilkinson, 2001). One of the guiding principles of the development of ICD-11 was to improve clinical utility, and to make clearer statements about differential diagnosis (First et al., 2015). Given the omission of subtypes in the current proposal (Maercker et al., 2013), the use of accessory symptoms in the assessment of AjD is redundant and creates problems regarding multicollinearity and comorbidities. Consequently, future research should focus on a reduction of symptom indicators with a clear focus on the core symptoms of AjD. This should lead to a more parsimonious diagnostic entity and one that is more aligned with the stress-response syndrome that AjD is proposed to reflect (Maercker et al., 2013).

Stressful life events were extremely high in the present sample with every participant indicating at least one most stressful life event in the ADNM-20. A high prevalence of stressful life events seems plausible given the low intensity of the events on the list (e.g., family conflicts, moving to another home). So far, only one other study that investigated AjD in a general population based sample did not specify the exposure to a stressful life event as a mandatory inclusion criterion and found a considerably lower prevalence of 53.9% (Maercker et al., 2012). It could be argued that the entire Israeli population are confronted with potentially traumatic experiences due to recent conflicts and terror attacks (Ben-Ezra et al., 2018 in press; Ben-Ezra et al., 2018). Given high occurences of trauma experiences in the present sample (Ben-Ezra et al., 2018 in press; Ben-Ezra et al., 2018), high occurences of non-traumatic experiences are not surprising and a strict differentiation between traumatic and non-traumatic stressors in could be criticised (Larsen & Pacella, 2016). Another possible explanation for this result could be a methodological effect. The ADNM-20 asks to indicate stressful life events that occured during the past two years on a list of possible life events with their month and year of occurrence. Indicating month and year of occurrence could be a hassle to some individuals that leads to a less careful response. It then asks to indicate the personally most distressing life event with a separate instruction. It could be that the particpants referred to life time instead of the previous two years here. Given the intended revision of the scale (Lorenz et al., 2017), one focus could be the simplification of the first part of the ADNM-20. Given the partial conflation of traumatic and non-traumatic experiences (Larsen & Pacella, 2016), the assessment of both event types in one instrument could be a possible solution when investigating disorders specifically associated with stress.

Naturally, this study has some limitations. The cross-sectional nature of the data does not allow assumptions about the stability of the construct over time. Likewise, the origin of the data in a specific population does not allow conclusions to be drawn about the stability of the construct across cultures. Furthermore, the source of the data based on self-report questionnaires does not allow conclusions to be drawn about the stability of the construct across methods of assessment. Thus, future studies should include multiple measurement occasions, diverse populations, and other means of assessment in order to ensure more robust findings with regard to the nature and key characteristics of AjD.

5. Conclusions

AjD will be grouped together with posttraumatic stress disorder, complex posttraumatic stress disorder, and prolonged grief in the disorders specifically associated with stress category in ICD-11 (Maercker et al., 2013), all of which have been simplified in order to adhere to the ICD-11 demands of clinical utility (First et al., 2015). The ADNM-20 as a preliminary questionnaire for the assessment of AjD symptoms offered the opportunity to investigate a wide range of possible AjD symptoms among a general population based sample from Israel. Since our findings suggest a unidimensional conceptualisation of AjD as a stress-response syndrome, a focus on essential key characteristics of AjD could improve validity and utility of the diagnosis.

Disclosure of interest

The authors declare that they have no competing interests. Andreas Maercker is chair of the work group on Disorders specifically associated

with stress. The opinions expressed in this paper do not represent any official WHO policy but rather the view of the author(s).

Funding

The study was funded by Ariel University's research authority internal grant awarded to MBE under the grant number: RA1700000037.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.janxdis.2018.01.007.

References

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika, 52*, 317–332. http://dx.doi.org/10.1007/BF02294359.

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Arlington, VA: Author.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Arlington, VA: Author.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: Author.

Bachem, R., Perkonigg, A., Stein, D. J., & Maercker, A. (2016). Measuring the ICD-11 adjustment disorder concept: validity and sensitivity to change of the Adjustment Disorder – New Module questionnaire in a clinical intervention study. *International Journal of Methods in Psychiatric Research,* 1–9. http://dx.doi.org/10.1002/mpr.1545.

Ben-Ezra, M., Karatzias, T., Hyland, P., Brewin, C. R., Cloitre, M., Bisson, J. I., et al. (2018). Posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) as per ICD-11 proposals: A population study in Israel. *Depression and Anxiety* in press.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*, 238–246. http://dx.doi.org/10.1037/0033-2909.107.2.238.

Bley, S., Einsle, F., Maercker, A., Weidner, K., & Joraschky, P. (2008). Anpassungsstörungen – Die Erprobung eines neuen diagnostischen Konzepts in einem ambulanten psychosomatischen Setting. *Psychotherapie, Psychosomatik, Medizinische Psychologie, 58*, 446–453. http://dx.doi.org/10.1055/s.

Casey, P., & Bailey, S. (2011). Adjustment Disorders: The state of the art. *World Psychiatry, 10*, 11–18.

Casey, P., & Strain, J. J. (2016). *Trauma- and stressor-related disorders.* Arlington, VA: American Psychiatric Association Publishing.

Casey, P., Dowrick, C., & Wilkinson, G. (2001). Adjustment disorders. Fault line in the psychiatric glossary. *British Journal of Psychiatry, 179*, 479–481. http://dx.doi.org/10.1192/bjp.179.6.479.

Casey, P., Maracy, M., Kelly, B. D., Lehtinen, V., Ayuso-Mateos, J. L., Dalgard, O. S., et al. (2006). Can adjustment disorder and depressive episode be distinguished? Results from ODIN. *Journal of Affective Disorders, 92*, 291–297. http://dx.doi.org/10.1016/j.jad.2006.01.021.

Dannemann, S., Einsle, F., Kämpf, F., Joraschky, P., Maercker, A., Weidner, K., et al. (2010). Anpassungsstärungen nach einem neuen diagnostischen Konzept bei Patienten einer psychosomatischen Poliklinik – Beschwerden, Veränderungsbereitschaft und Psychotherapiemotivation [New diagnostic concept of adjustment disorders in psychosomatic outpatients]. *Zeitschrift Für Psychosomatische Medizin Und Psychotherapie, 56*, 231–243. http://dx.doi.org/10.13109/zptm.2010.56.3.231.

Einsle, F., Köllner, V., Dannemann, S., & Maercker, A. (2010). Development and validation of a self-report for the assessment of adjustment disorders. *Psychology, Health & Medicine, 15*, 584–595. http://dx.doi.org/10.1080/13548506.2010.487107.

First, M. B., Reed, G. M., Hyman, S. E., & Saxena, S. (2015). The development of the ICD-11 clinical descriptions and diagnostic guidelines for mental and behavioural disorders. *World Psychiatry, 14*, 82–90. http://dx.doi.org/10.1002/wps.20189.

Glaesmer, H., Romppel, M., Braehler, E., Hinz, A., Maercker, A., Brähler, E., et al. (2015). Adjustment disorder as proposed for ICD-11: Dimensionality and symptom differentiation. *Psychiatry Research, 229*, 940–948. http://dx.doi.org/10.1016/j.psychres.2015.07.010.

Horowitz, M. J. (2001). *Stress response syndromes.* Northvale, N.J: Aronson.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1–55. http://dx.doi.org/10.1080/10705519909540118.

iPanel (2015). *iPanel – the leading online panel in Israel.* Retrieved from: https://www.ipanel.co.il/en/.

Joreskog, K. G. (1999). *How Large Can a Standardized Coefficient be?* Retrieved from: http://www.ssicentral.com/lisrel/techdocs/HowLargeCanaStandardizedCoefficientbe.pdf, on 08/30/2017.

Keeley, J. W., Reed, G. M., Roberts, M. C., Evans, S. C., Robles, R., Matsumoto, C., et al. (2016). Disorders specifically associated with stress: A case-controlled field study for ICD-11 mental and behavioural disorders. *International Journal of Clinical and Health Psychology, 2*, 109–127. http://dx.doi.org/10.1016/j.ijchp.2015.09.002.

Kline, R. B. (2005). *Principles and practice of structural equation modeling, vol. 156*London, UK: The Guilford Presshttp://dx.doi.org/10.1038/156278a0.

Larsen, S. E., & Pacella, M. L. (2016). Comparing the effect of DSM-congruent traumas vs: DSM-incongruent stressors on PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders, 38*, 37–46.

Lo, Y., Mendell, N., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*, 767–788.

Lorenz, L., Hyland, P., Perkonigg, A., & Maercker, A. (2017). Is adjustment disorder unidimensional or multidimensional? Implications for ICD-11. *International Journal of Methods in Psychiatric Research,* e1591. http://dx.doi.org/10.1002/mpr.1591.

Maercker, A., Einsle, F., & Köllner, V. (2007). Adjustment disorders as stress response syndromes: a new diagnostic concept and its exploration in a medical sample. *Psychopathology, 40*, 135–146. http://dx.doi.org/10.1159/000099290.

Maercker, A., Forstmeier, S., Pielmaier, L., Spangenberg, L., Braehler, E., Glaesmer, H., et al. (2012). Adjustment disorders: Prevalence in a representative nationwide survey in Germany. *Social Psychiatry and Psychiatric Epidemiology, 47*, 1745–1752. http://dx.doi.org/10.1007/s00127-012-0493-x.

Maercker, A., Brewin, C. R., Bryant, R. A., Cloitre, M., Van Ommeren, M., Jones, L. M., et al. (2013). Diagnosis and classification of disorders specifically associated with stress: Proposals for ICD-11. *World Psychiatry, 12*, 198–206. http://dx.doi.org/10.1002/wps.20057.

Muthén, L. K., & Muthén, B. O. (2013). *MPlus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.

Muthén, L. K. (2007). *Loading greater than one in a EFA with categorical.* Accessed 4 August 2017 http://www.statmodel.com/discussion/messages/9/2528.html?1412177501.

O'Donnell, M. L., Alkemade, N., Creamer, M., Mcfarlane, A. C., Silove, D., Bryant, R., et al. (2016). A longitudinal study of adjustment disorder after trauma exposure. *American Journal of Psychiatry, 173*, 1231–1238. http://dx.doi.org/10.1176/appi.ajp.2016.16010071.

Reise, S. P. (2012). The rediscovery of bifactor measurement models. *Multivariate Behavioral Research, 47*, 667–696. http://dx.doi.org/10.1080/00273171.2012.715555.

Schwartz, G. (1978). Estimating the dimension of a model. *Annals of Statistics, 6*, 461–464.

Sclove, S. L. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika, 52*, 333–343. http://dx.doi.org/10.1007/BF02294360.

Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research, 25*, 173–180. http://dx.doi.org/10.1207/s15327906mbr2502_4.

Strain, J. J., & Diefenbacher, A. (2008). The adjustment disorders: The conundrums of the diagnoses. *Comprehensive Psychiatry, 49*, 121–130. http://dx.doi.org/10.1016/j.comppsych.2007.10.002.

Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 well-being index: A systematic review of the literature. *Psychotherapy and Psychosomatics, 84*, 167–176. http://dx.doi.org/10.1159/000376585.

Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38*, 1–10. http://dx.doi.org/10.1007/BF02291170.

World Health Organisation (1998). *Wellbeing Measures in Primary Health Care/The Depcare Project.* Stockholm, Sweden: World Health Organisation Retrieved from http://www.euro.who.int/_data/assets/pdf_file/0016/130750/E60246.pdf.

World Health Organization (1992). *The ICD-10 classification of mental and behavioural disorders, vol. 10.* Geneva: World Health Organization.

Yuan, K. H., & Bentler, P. M. (2000). Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological Methodology, 30*, 165–200. http://dx.doi.org/10.1111/0081-1750.00078.

Zelviene, P., Kazlauskas, E., Eimontas, J., & Maercker, A. (2017). Adjustment disorder: Empirical study of a new diagnostic concept for ICD-11 in the general population in Lithuania. *European Psychiatry, 40*, 20–25. http://dx.doi.org/10.1016/j.eurpsy.2016.06.009.