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<b>The network structure of ICD-11 Adjustment Disorder: A cross-cultural comparison of three African countries</b>	5
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<b>Abstract</b>	26
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<b>Background:</b> Adjustment disorder (AjD) is one of the most widespread mental disorders worldwide. In ICD-11, AjD is characterized by two main symptom clusters; preoccupation with the stressor and failure to adapt. The network analytic approach has been applied to most ICD-11 stress related disorders. However, no study to date explored the relations between symptoms of AjD using network analysis.	28 29 30 31 32
<b>Aims:</b> We aimed to explore AjD symptoms network and whether its structure replicates across questionnaire versions and samples.	33 34
<b>Methods:</b> A network analysis was conducted on AjD symptoms as assessed by the Adjustment Disorder–New Module (ADNM-8) and an ultra-brief version (ADNM-4) using data from 2,524 participants in Nigeria (n = 1006), Kenya (n = 1018), and Ghana (n = 500).	35 36 37 38
<b>Results:</b> There were extensive connections between items across all samples in both ADNM versions. Results highlight that preoccupation symptoms seem to be more prominent in terms of edges strengths and had the highest centrality in all networks across samples and ADNM versions. Comparisons of network structure invariance revealed one difference between Nigeria and Ghana in both ADNM versions. Importantly, the ADNM-8 global strength was similar in all networks whereas in the ADNM-4 Kenya had a higher global strength score compared to Nigeria	39 40 41 42 43 44 45
<b>Conclusions:</b> Results provide evidence of the coherence of AjD in the ICD-11 as assessed by the ADNM questionnaire. The prominence of preoccupation symptoms in AjD highlight a possible therapeutic target to alleviate distress. There is a need to further replicate the network structure of AjD in non-African samples.	46 47 48 49 50

Keywords: ICD-11 Adjustment Disorder; Statistical Methodology; Trauma; 51  
Individual Psychotherapy 52

For Peer Review

<b>The network structure of ICD-11 Adjustment Disorder: A cross-cultural</b>	54
<b>comparison of three African countries</b>	55
<b>Adjustment disorder in ICD-11</b>	56
Adjustment disorder (AjD) has been identified as one of the most prevalent mental	57
disorders worldwide. <sup>1,2</sup> According to ICD-11 <sup>3</sup> AjD is a maladaptive reaction to a	58
stressful life event, ongoing psychosocial adversities or a combination of stressful life	59
situations that usually emerges within a month of the occurrence of a stressor and	60
tends to resolve within six months, unless the stressor persists for a longer duration. In	61
ICD-11, AjD is characterized by two main symptom clusters: 'preoccupations with the	62
stressor', which includes symptoms such as recurrent and distressing thoughts or	63
rumination about the stressor or its implications, and 'failure to adapt', which includes	64
difficulties concentrating, sleep disturbances and an inability to recover	65
emotionally. <sup>4,5</sup> For a diagnosis of AjD, the symptoms must be associated with	66
significant impairment in functioning.	67
<b>Operationalization of Adjustment Disorder</b>	68
The introduction of specific diagnostic criteria in ICD-11 represents a change	69
in the conceptualization of AjD which previously was considered as a diagnosis if a	70
person failed to meet criteria for another disorder. <sup>4</sup> In parallel to the development of	71
the AjD symptom criteria, a scale to assess AjD has been developed for validation of	72
the newly proposed concept. Maercker, Einsle and Kollner (2007) introduced and	73
initially validated a 29-item self-report questionnaire, the Adjustment Disorder–New	74
Module (ADNM), which was later condensed to 20 items. <sup>6</sup> The ADNM-20 can be	75
used to assess the two core symptom clusters of AjD in ICD-11 (preoccupation with	76
the stressor and failure to adapt), as well as accessory stress-related symptoms	77

(depression, anxiety, avoidance, impulsivity). Several validation studies of both ADNM versions indicated good psychometric properties (e.g., convergent and discriminant validity, factor structure, internal consistency).<sup>6,7</sup> More recently and in line with the conceptualization of AjD in the ICD-11, an 8-item brief version, consisting of only the core symptoms<sup>8</sup> and an ultra-brief measure consisting of only two items of preoccupation and two items of failure to adapt<sup>9</sup> were produced and validated. Findings demonstrate that both the brief ADNM-8 and the ultra-brief ADNM-4 subscales are reliable and valid instruments for the assessment of AjD.<sup>8,9</sup>

### **Network Analytic methods**

The coherence of ICD-11 AjD has been predominantly explored using factor analytic methods, as described in the above-mentioned studies. However, factor analytic models assume a pre-determined set of factors.<sup>10</sup> This inherent limitation of latent variable models means they are less efficient in providing the full complexity of relations among the different symptoms of AjD. The network approach, on the other hand, conceptualizes mental disorders as systems of connected symptoms rather than reflecting an unobservable disorder. The symptoms co-occur because they reciprocally reinforce each other, not because they arise from a common underlying cause.<sup>10,11</sup> One of the advantages of the network approach is that the interconnections of symptoms can be mathematically analyzed and visually exemplified. A network structure consists of "nodes" that represent the symptoms studied and edges that represent the relationship between nodes. Edges have thicknesses ("weights") corresponding to the strength of the association between the nodes they connect. Graph theory has been used to represent different spatial and functional characteristics that reveal information about the type of relationship between the nodes in the network.<sup>12</sup> Visualizing AjD in this way allows insight into the complex relations

among its symptoms and allows estimating the structure of the different measures 103  
described. 104

From a clinical point of view, network analytic techniques place the focus on 105  
understanding the individual symptoms of a syndrome and can identify the symptoms 106  
that are most central within the AjD network and convey high level of clinical 107  
information.<sup>12</sup> Central symptoms are those having many strong connections to other 108  
symptoms, greater numbers of connections, and those that bridge between other 109  
symptoms.<sup>13</sup> Identifying central symptoms of a disorder is of crucial importance to 110  
clinicians in order to guide intervention efforts. It may also identify key symptoms 111  
associated with the prognosis of patients, rather than trusting on global scores or a 112  
dichotomous diagnosis. Preliminary findings suggest that symptom centrality is 113  
related to the longitudinal course of a disorder.<sup>14</sup> In the case of AjD, very few 114  
disorder-specific interventions have been developed to date<sup>15</sup> and thus, obtaining 115  
information on symptom centrality may be particularly relevant for improving future 116  
treatment efforts. 117

The network analytic approach has been applied to most ICD-11 stress related 118  
disorders, such as complicated grief<sup>16</sup>, posttraumatic stress disorder and complex 119  
posttraumatic stress disorder.<sup>17</sup> However, to date, AjD has not been explored using 120  
this statistical framework for its newly defined core symptoms. Considering the 121  
controversies around AjD and the new structure in ICD-11, it is worthwhile to explore 122  
AjD symptoms networks. 123

### **The current Study** 124

We aimed to analyze the symptoms network of ICD-11 AjD using scales that 125  
estimate the core symptoms only, i.e., the brief ADN-8 and the ultra-brief ADN- 126

4, in a a large dataset including three samples collected in Nigeria, Kenya and Ghana. 127  
 This strategy allowed to compare the similarity of the network results in both 128  
 questionnaire versions and across three different samples. We aimed to (1) assess 129  
 conceptual validity by exploring which of the symptoms are strongly associated with 130  
 one another and are geographically located adjacently. Support to the ICD-11 131  
 conceptualization would be reflected in stable connectivity of the network with high 132  
 connections amongst preoccupation symptoms and amongst failure to adapt 133  
 symptoms. Preoccupations should be associated to a lesser degree with failure to 134  
 adapt symptoms (2) examine which symptoms are most central and whether they 135  
 belong to the preoccupations- or the failure to adapt cluster, and (3) to explore the 136  
 stability of findings between samples and ADNMM versions. 137

## Methods 138

### Participants and Procedure 139

The study sample included 2,524 participants from Nigeria ( $n = 1,006$ ), Kenya ( $n =$  140  
 1,018), and Ghana ( $n = 500$ ). Each sample was drawn from a panel using stratified 141  
 and random probability sampling methods to ensure a close approximation of 142  
 representativeness in terms of census data on age and sex in each country (for more 143  
 info regarding sample see.<sup>18</sup> The study was approved by the institutional review board 144  
 at Ariel's University [AU-MBE-2018-1029]. Each participant signed an electronic 145  
 informed consent prior to participation. Inclusion criteria were citizenship of one of 146  
 the following countries (Nigerian. Ghana, and Nigeria), age over 18 and having 147  
 English proficiency. 148

### Measurements 150

The Adjustment Disorder–New Module-8 (ADNM-8<sup>8</sup>) assesses the preoccupation and failure to adapt similarly to the ICD-11. Participants first rate a list of stressors, indicating which stressors they experienced during the previous two years. Then, they rate the presence of AjD symptoms during the last two weeks. Four items refer to preoccupation with the stressor(s) and four items assess failure to adapt symptoms (see Table 1). Each item is scored on a 4-point Likert-type scale (1=never, 2=rarely, 3=sometimes, 4=often). The total score of the ADNM-8 is the sum of responses to all items, and higher scores are indicative of greater severity of AjD. The internal reliabilities of the ADNM-8 were satisfactory for Ghana (.91), Kenya (.90) and Nigeria (.90) for the total scores as well as for the preoccupation and the failure to adapt subscales, in Ghana (.85, .83), Kenya (.85, .84) and Nigeria (.86, .83), respectively.

The Adjustment Disorder–New Module-4 (ADNM-4<sup>9</sup>) is an ultra-brief version of the ADNM-8 with a clear factor structure and good convergent and discriminant validity. It assesses AjD core symptoms (preoccupations and failure to adapt) with two items each (see Table 1). Each item is scored on a 4-point Likert-type scale (1=never, 2=rarely, 3=sometimes, 4=often). The score of the total ADNM-4 is the sum of responses to all items, and higher scores are indicative of greater severity of AjD. The internal reliability of the ADNM-4 preoccupation and failure to adapt scales were acceptable for Ghana (.82), Kenya (.83) and Nigeria (.80) samples.

### **Statistical analysis**

#### **Regularized partial correlation networks across the three samples**

More information regarding network estimation and stability and accuracy of both edges and the centrality index techniques can be found in supplementary materials.



**Network estimation and visualization:** We estimated partial pairwise correlations parameters between all nodes, through a Gaussian Graphical Model (GGM). The methodology is described in details in the supplementary materials section. We used the graphical least absolute shrinkage and selection operator (Graphical Lasso; implemented in qgraph), which visualizes sparse networks using part correlations and considered the ordinal scale of the questionnaire.

**Network stability:** We examined the stability of the individually estimated networks, including estimating 95% confidence intervals around the edge weights and estimating a correlation-stability coefficient for strength centrality. More information regarding the network analysis techniques can be found in supplementary materials, and in a tutorial.<sup>19</sup>

**Network comparisons:** To compare differences between networks, we estimated network differences between each pair of networks using the *NetworkComparisonTest* (NCT) package in R.<sup>20</sup> More information regarding the network comparisons techniques can be found in supplementary materials.

## Results 190

### Descriptive information 191

Table 1 shows the mean scores on the AjD core symptoms items across the three samples. All items differed across the three samples, although the effect size ( $\eta^2$ : small = .10, medium = 0.25, large = 0.50) were generally small. The Kenyan sample had higher mean scores in all individual symptoms compared to both Ghana and Nigeria. The rates of probable AjD were high in all three countries; Ghana (23.4%), Kenya (27.8%), and Nigeria (17.7%). The samples had also different number of stressors  $F(2, 2521) = 34.91$   $p < .001$   $\eta^2 = .03$  which is a medium-large effect. People from Kenya and Nigeria reported higher rates of stressors compared to Ghana, in

particular assault, financial problems, move to a new home, unemployment, illness of	200
loved one, and death of a loved one.	201
<b>Regularized partial correlation networks across the three samples</b>	202
<b>Network estimation of the ADN-8</b>	203
Estimated networks are shown in the supplementary materials (Fig. SM1 in	204
supplementary materials). To enhance visual comparability of edges, we estimated the	205
average layout of the three networks and presented all networks using this layout (Fig.	206
1). In the ADN-8 symptoms network, 19 of 28 possible edges (68.8%) in the Ghana	207
network, 21 of 28 possible edges (75.0%) in the Kenya network, and 20 of 28 possible	208
edges (71.4%) in the Nigeria network were nonzero. This designates that the	209
symptoms had extensive connections with each other in all samples. The visual	210
inspection of the three networks exhibited many consistent edges across the samples,	211
such as most robust connections between the preoccupation item: 'repeated thoughts'	212
(item 1) and 'sense of burden' (item 2). Next in the hierarchy of edges strength is the	213
association between the impairment in functioning item (item 8) and failure to adapt	214
items (item 6 - 'difficulties doing work/tasks' and item 7 - 'sleep difficulties').	215
In the Nigerian sample, there was also a substantial association between the failure to	216
adapt items 6 ('difficulties going to work/doing daily tasks'), and 7 ('sleep	217
difficulties'), as well as a strong association between the preoccupation items 4	218
('constant memories') and 5 ('thoughts often revolve'). In the Ghana sample, the	219
preoccupation item 4 ('constant memories') was strongly associated with the failure to	220
adapt item 3 ('difficulties concentrating').	221
<b>Network stability of the ADN-8</b>	222

To confirm the visual similarity of networks, we used Spearman correlations of edge-weights for all combinations of networks, presented in supplementary materials.

Analysis shows that the accuracy of the edges was satisfactory.

The results of the confidence interval showed that edge-weights were moderately large. In addition, the results showed low accuracy of the centrality strength index (see supplementary material text, results: Network accuracy and stability and Fig. SM3-SM6).

### **Network inference of the ADN-8**

The standardized strength centrality estimates are presented in Fig. SM2 in supplementary material. Item 2 ('sense of burden') was the node with the highest strength centrality in all networks. However, the nodes with the smallest centrality differ between networks, though in all of them, it was from the 'failure to adapt' subscale. In the Ghana network, it was the 'difficulties going to work/doing daily tasks', in the Kenya network, it was 'sleep problems', and in the Nigeria network, it was 'constant memories'.

### **Network comparisons of the ADN-8**

Results from the network comparison test showed that global strength values per group were 3.56, 3.55 and 3.51 for Ghana, Kenya and Nigeria, respectively (Statistics for each pair of samples ranged 0.01 to 0.06 and  $p$  value ranged .32 to .89).

The Nigeria network structure differed from Ghana ( $M=.19, p=.01$ ). Kenya and Ghana ( $M=.14, p=.28$ ) as well as Kenya and Nigeria ( $M=.09, p=.59$ ) were similar concerning structure and the level that nodes that were connected.

### **Network estimation of the ADN-4**

Estimated networks are shown in the supplementary materials (Fig. SM7 in supplementary materials). We estimated the average layout of the three networks and

presented all networks using this layout (see Fig. 2). In the symptoms network of the 248  
 AjD according to the ADN-4, six of six possible edges (100%) in the Ghana and 249  
 Kenya networks, and five of six possible edges (83.3%) in the Nigeria network were 250  
 nonzero. This designates that the symptoms had highly extensive connections with 251  
 each other in all samples. 252

The visual inspection of the three networks exhibited many similarities across 253  
 the three samples, such as most robust connections between the two items of the 254  
 preoccupation items and between the two items of the failure to adapt scale. The third 255  
 item of difficulties in concentrating was associated with the two preoccupation items. 256  
 The fourth item of difficulties with work/tasks was relatively weakly related to the 257  
 failure to adapt items. 258

#### **Network stability of the ADN-4** 259

The results of the confidence interval showed that edge-weights were moderately 260  
 large. In addition, the results showed high accuracy of the centrality strength index 261  
 (see supplementary material, Results: Network accuracy and stability and Fig. SM9- 262  
 SM12 for more details). 263

#### **Network inference of the ADN-4** 264

Analysis shows that the accuracy of the edges is satisfactory. The standardized 265  
 strength centrality estimates are presented in Fig. SM8. Item 2 ('constant memories') 266  
 was the node with the highest strength centrality in all networks. In the Kenyan 267  
 network, it was equally central with item 3 ('difficulties to concentrate'). In all three 268  
 networks the least central item was 'difficulties in work/tasks'. 269

#### **Network comparison of the ADN-4** 270

Global strength values per group were 1.51, 1.55 and 1.48 for Ghana, Kenya and 271  
 Nigeria, respectively. Ghana did not differ from Kenya ( $S=0.04$   $p=.40$ ) and Nigeria 272

( $S=.03$   $p=.53$ ). The Kenyan network had a higher global strength compared to Nigeria 273  
 ( $S=0.6$   $p=.05$ ). The Nigerian network structure differed from that of Ghana ( $M=.15$  274  
 $p=.05$ ). Kenyan and Ghana ( $M=.11$   $p=.34$ ) as well as Kenyan and Nigeria ( $M=.11$  275  
 $p=.12$ ) networks were similar concerning structure and the level that nodes were 276  
 connected. 277

## Discussion 278

The current study investigated the symptom network structure of the ICD-11 AjD in 279  
 three nationally representative samples from Nigeria, Kenya, and Ghana. To our 280  
 knowledge, this was the first investigation of the *ICD-11* AjD network structure. 281  
 Results suggested extensive connections between items in all samples in the ADN-8 282  
 and robust highly extensive associations in the ADN-4 network. The network 283  
 structure was relatively consistent across questionnaire versions and countries 284  
 regarding the inter associations between nodes, and results suggest that preoccupation 285  
 symptoms seem to be most central to the clinical picture of AjD. This consistency of 286  
 findings provides further evidence for the conceptual validity of this newly defined 287  
 condition as assessed by the ADN questionnaire. In particular, the clinical picture 288  
 arising from the findings gives support to the preoccupation symptoms as more 289  
 central, while failure to adapt symptoms and functioning were intertwined. 290

The first aim of the study was to assess conceptual validity of AjD by exploring 291  
 the individual symptoms' dynamics (i.e., evaluating which of the symptoms are 292  
 strongly associated with one another). The results partially support the syndromic 293  
 integrity of ICD-11 AjD as assessed by ADN-8. Specifically, there was high 294  
 connectivity between two preoccupation items – Item 1 ‘repeated thoughts’ and Item 295  
 2 ‘sense of burden’. While the first symptom represents an objective observation of 296  
 repeated thoughts, the second symptom represents the subjective appraisal of burden 297

related to repeated thoughts. However, across all three networks, the remaining two 298  
preoccupation items (Items 4, 5) were not highly connected to the network based on 299  
partial correlations, which suggests that they do not add unique variance to the AjD 300  
network. Scrutinizing the phrasing of the items, it is evident that Item 1, Item 4 and 301  
Item 5 are highly similar. It is possible that these items assess the same symptom 302  
(repetitive thoughts about the stressor) rather than representing distinct symptoms of 303  
the preoccupation syndrome. In line with this explanation, both preoccupation items 304  
of the ADN-4 (Item 2 and Item 4) were highly connected and seem to represent 305  
distinct aspects of the preoccupation syndrome, that are significant above and beyond 306  
others. This finding suggests that the ADN-4 may be sufficient to represent 307  
preoccupations as assessed by the ADN questionnaire and implies that some items 308  
on the 8-item version may have been redundant. This is further shown by satisfactory 309  
stability of the strength centrality in the ADN-4 network as opposed to the poor 310  
stability of the strength centrality in the ADN-8. Nevertheless, future research 311  
should evaluate whether they adequately cover the preoccupation cluster of AjD. 312

Failure to adapt items did not represent a strongly interrelated network in the 313  
ADN-8. This finding is in line with earlier observations of acceptable but relatively 314  
low internal consistencies of the subscale, ranging from Cronbach's  $\alpha = .71$  in a help- 315  
seeking sample<sup>8</sup> to  $\alpha = .80$  in a non-clinical sample exposed to burglary<sup>7</sup>. The weaker 316  
associations between different failure to adapt nodes as compared to preoccupation 317  
nodes, however, has face validity, since they cover a variety of symptoms from 318  
concentration difficulties to sleep problems. Interestingly, the analysis of the network 319  
structure revealed that two failure to adapt items (Item 6 'difficulties doing work/tasks' 320  
and Item 7 'sleep difficulties') are strongly associated with functional impairment in 321  
AjD. This finding suggests that failure to adapt symptoms as assessed by the ADN- 322

8 are more strongly associated with functional impairment compared to preoccupation 323  
symptoms. It can also imply that failure to adapt is intertwined with functional 324  
impairment, perhaps a subjective perception of it, as opposed to more actual 325  
malfunctioning. 326

The failure to adapt Item 3 ('concentration difficulties') was associated to an 327  
equal extent with preoccupation symptoms as with other failure to adapt symptoms. 328  
Consequently, concentration difficulties may act as a bridge symptom between the 329  
two core symptom clusters, potentially increasing the likelihood of experiencing one 330  
syndrome when experiencing the other.<sup>21</sup> Concentration problems may be a result of 331  
both preoccupation and failure to adapt symptoms. For example, it is possible that 332  
preoccupations, such as constant, uncontrollable memories (e.g., Item 4), are a cause 333  
of concentration difficulties among patients with AjD. At the same time, 334  
concentration difficulties may result from sleep problems (Item 7), which belongs to 335  
the failure to adapt cluster. As the network approach does not assume that the 336  
indicators of a disorder are independent, it can visualize such potentially causal 337  
relations.<sup>11</sup> Future research is needed in order to clarify the temporal order and 338  
interdependence of AjD symptoms. 339

Overall, the two AjD core symptom clusters of preoccupations and failure to 340  
adapt were clearly interrelated. This finding aligns with previous factor analytical 341  
studies that lent support to a unidimensional conception of AjD as assessed by the 342  
ADNM. They showed high correlations between .75 to .96 between subfactors of 343  
AjD.<sup>6,22</sup> The current study contributes this evidence by using a methodology that did 344  
not assume latent factor but rather visualizes the complex relations between 345  
symptoms. 346

The second aim of the study was to examine which symptoms are most central to the AjD network and whether they belong to the preoccupations- or the failure to adapt core symptom clusters. In the ADN-8 and ANDM-4, the node with the highest strength centrality was of the preoccupation scale. More specifically, in ADN-8 the preoccupation Item 2 ('sense of burden') had the highest strength centrality in all three networks. This finding, however, was limited by the fact that the stability of the index was insufficient, creating some ambiguity about the centrality of this preoccupation symptom. Thus, the ADN-4 network was explored and yet again a preoccupation item (Item 2 'constant memories') showed the most strength centrality, with high and satisfying stability. Highly central symptoms have the potential to maintain a disorder.<sup>23</sup> The results thus highlight the relatively higher importance of preoccupation symptoms as compared to failure to adapt symptoms. This finding aligns with results from a longitudinal study over a 1-year period which showed that intrusive memories was the symptom that was most likely to be associated with a diagnosis of AjD.<sup>24</sup>

Finally, the study aimed to explore the stability of findings between samples and measures. The overall connectivity was similar across countries. However, as could be expected, there were several differences between the networks of different countries. While Nigeria and Kenya, as well as Ghana and Kenya did not differ in terms of network structure invariance, Nigeria and Ghana differed significantly in both ADN-8 and ADN-4. Importantly, the global score of the ADN-8 was similar in all networks. This implies that the associations have the same magnitude of overall connectivity in all networks as well as same structure, but the edges structure is significantly different between the Nigeria and Ghana networks. This difference may be rooted in the Nigerian sample, which had stronger associations of two failure



to adapt items (Items 6, 7) than was the case in the samples from Ghana and Kenya. 372  
Moreover, among the preoccupation symptoms the Nigerian network also included 373  
stronger connections (Items 4, 5) compared to the other samples, which indicates that 374  
both core symptom clusters were more distinctly represented in the Nigerian sample. 375  
Interestingly, studies show that Nigeria may be a particularly disadvantaged country 376  
with regard to mental health access and support.<sup>25</sup> There was higher level of exposure 377  
to life events in Nigeria compared to Ghana and equal exposure to life events 378  
compared to Kenya<sup>18</sup>. It may be speculated that the higher prevalence of exposure 379  
may result in higher support of the AjD structure in the Nigerian network compared to 380  
Ghana. 381

The study has several limitations. First, it relied on self-report data rather than 382  
clinician-administered interviews, which may have biased the reports. Second, 383  
findings in community samples may not generalize to treatment-seeking or clinical 384  
samples. Third, the stability of the centrality index in the ADN-8 networks was not 385  
high enough. However, the high stability in the ADN-4 networks confirmed the 386  
centrality of preoccupations and made our conclusions more solid. Fourth, the cross- 387  
sectional nature of the data does not allow for any inferences on causality. Fifth, the 388  
samples that were examined represented non-western cultures and it remains to be 389  
explored in replication studies whether the results generalize to western societies. 390  
However, given the rarity of studies focused on AjD in a non-western context, the 391  
findings also represent an important step in validating the ICD-11 AjD concept more 392  
widely. 393

Despite these limitations, the current findings provide an important first 394  
impression of the network structure of AjD and revealed patterns of association that 395  
can guide future research and practice. Despite cultural variations in samples, the 396

structure of the network remained relatively consistent across all three countries. First 397  
and foremost, results provide further evidence for the validity of this newly defined 398  
condition, particularly with regard to the preoccupation syndrome. As the ICD-11 and 399  
the DSM-5 conceptualizations of AjD differ, most significantly with regard to the 400  
focus on preoccupation with the stressor in ICD-11, investigations regarding the 401  
nature of the preoccupation syndrome are crucial. The current study sheds light on the 402  
two AjD core symptom criteria of the ICD-11 and shows the complexity in the 403  
relationship between them. 404

One of the major benefits of defining specific symptom criteria for ICD-11 AjD 405  
is that it facilitates the development of disorder-specific interventions.<sup>6</sup> The current 406  
study further contributes to guide future intervention development by emphasizing the 407  
central role of preoccupation with the stressor and highlighting them as particularly 408  
promising targets for intervention. In cognitive behavioral therapy, for example, an 409  
important treatment component is psychoeducation regarding functional thoughts and 410  
problems solving, on the one hand, and dysfunctional rumination, on the other hand. 411  
Furthermore, imaginal exposure-based techniques may be adequate interventions if 412  
AjD patients are oscillating between preoccupations with the stressors and attempts to 413  
avoid remembering the stressor.<sup>15</sup> Given its central role in AjD networks across 414  
different questionnaire versions and countries, future research should aim to better 415  
understand the clinical importance of the preoccupation cluster. 416

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For Peer Review

**Table 1.**

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*F statistics, Means and Standard deviations of the ADNMM items of the three samples*

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ADNMM items	Ghana	Kenya	Nigeria	<i>F</i> (2,2051)	$\eta^2$
<b>Preoccupation</b>					
Item 1: I have to think about the stressful situation repeatedly	2.46 (.96) <sub>a</sub>	2.69 (.92) <sub>b</sub>	2.50 (.91) <sub>a</sub>	15.95***	.012
Item 2: I have to think about the stressful situation a lot and this is a great burden to me (Item 1 in ADNMM-4)	2.28 (1.09) <sub>a</sub>	2.49 (1.04) <sub>b</sub>	2.28 (1.01) <sub>a</sub>	12.75***	.010
Item 4: I constantly get memories of the stressful situation and can't do anything to stop them (Item 2 in ADNMM-4)	2.11 (.96) <sub>a</sub>	2.25 (1.04) <sub>b</sub>	2.06 (.98) <sub>a</sub>	9.65***	.010
Item 5: My thoughts often revolve around anything related to the stressful situation	2.21 (1.00) <sub>a</sub>	2.29 (.99) <sub>b</sub>	2.16 (.99) <sub>a</sub>	4.76***	.003
<b>Failure to adapt</b>					
Item 3: Since the stressful situation, I find it difficult to concentrate on certain things (Item 3 in ADNMM-4)	2.12 (.97) <sub>a</sub>	2.40 (1.04) <sub>b</sub>	2.02 (.96) <sub>a</sub>	37.15***	.030
Item 6: Since the stressful situation, I don't like going to work or carrying out necessary tasks in everyday life (Item 4 in ADNMM-4)	1.68 (.92) <sub>a</sub>	1.82 (.97) <sub>b</sub>	1.58 (.82) <sub>a</sub>	17.63***	.010
Item 7: Since the stressful situation, I can no longer sleep properly	1.89 (.96) <sub>a</sub>	2.06 (1.01) <sub>b</sub>	1.77 (.92) <sub>a</sub>	23.18***	.020
Item 8: Overall, the stressful situation affected me strongly in my personal relationships, my leisure activities, or in other important areas of life	1.80 (.94) <sub>a</sub>	1.94 (.99) <sub>b</sub>	1.73 (.91) <sub>a</sub>	13.67***	.010

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Note. All p values are &lt;.001, Means sharing a common subscript are not significantly

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different at  $\alpha = .01$  according to Bonferroni significant difference procedure.

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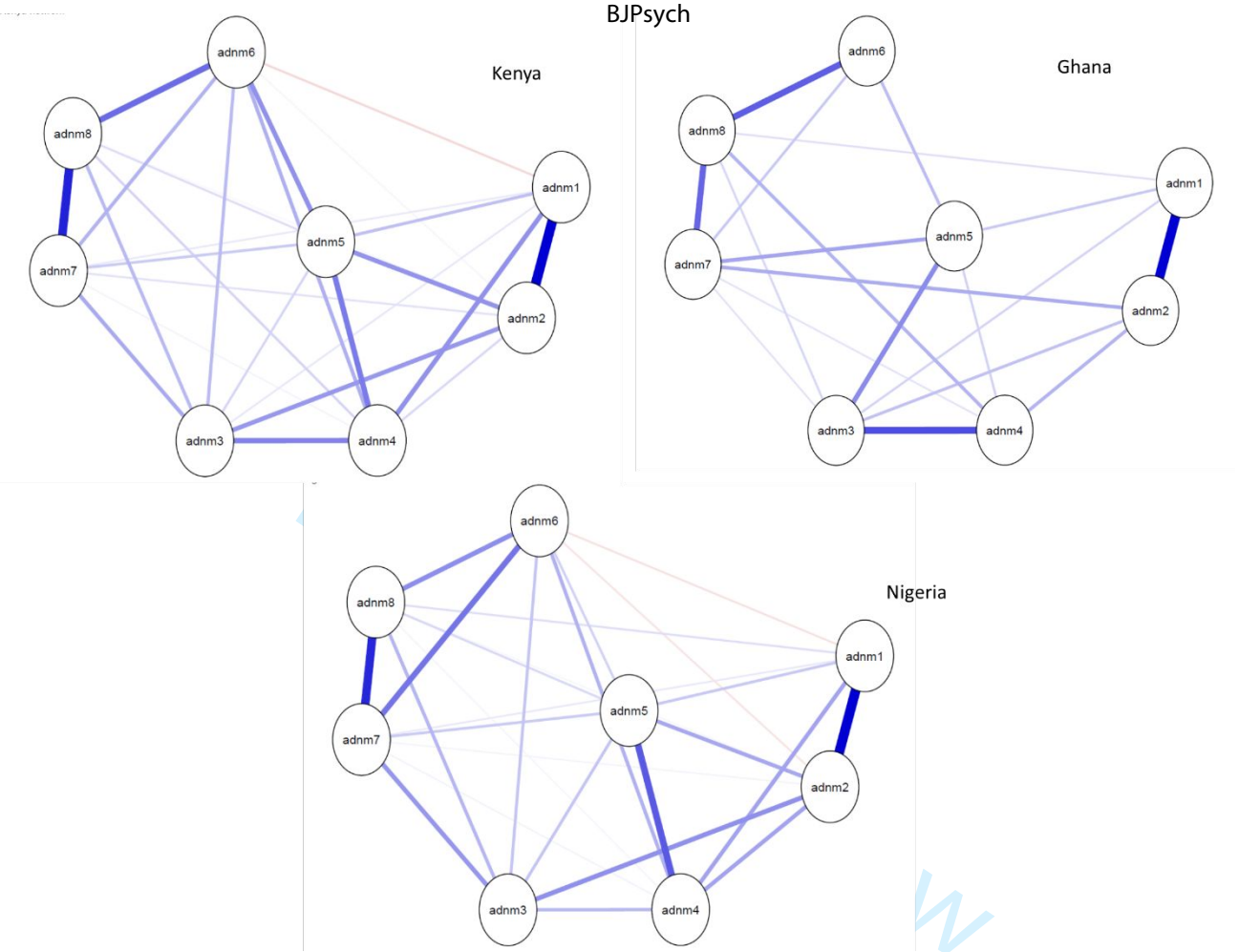


Fig 1. Networks of ADNM-8 Adjustment disorder symptoms in three African samples using average spring layout. Nodes represent ADNM-8 items, and edges Regularized partial correlations with LASSO penalty. Distances among nodes and thickness of edges relate to the size of their partial correlations. Blue edges indicate positive relations and Red edges indicate negative relationships. ADNM 1: Repeated thoughts, ADNM 2: Sense of burden; ADNM 3: Difficulties concentrating; ADNM 4: Constant memories; ADNM 5: Thoughts revolve; ADNM 6: Work/tasks difficulties; ADNM 7: Sleeping problems ADNM 8: Functional Impairment. The full items can be found in Table 1.



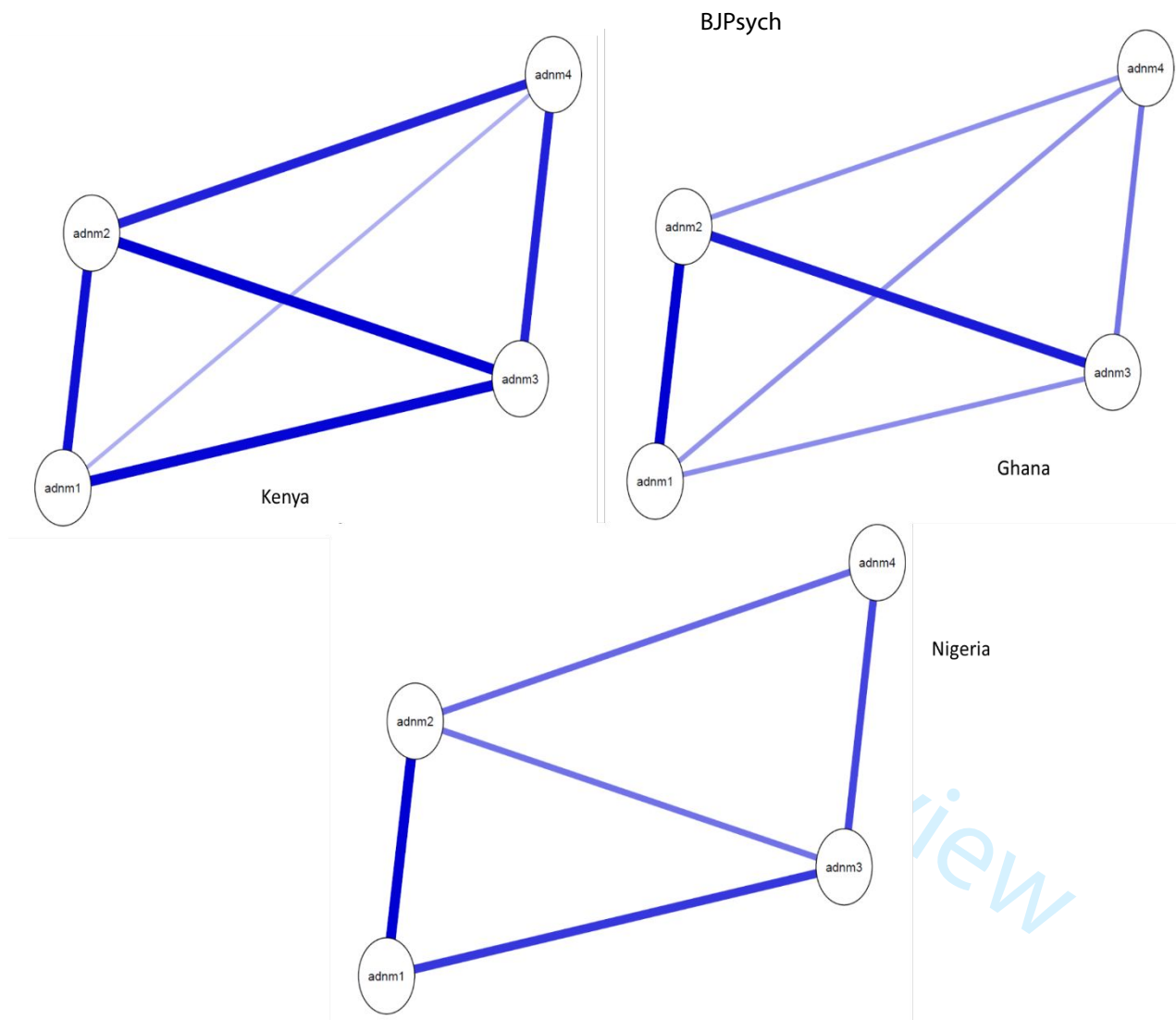


Fig 2. Networks of ADNM-4 Adjustment disorder symptoms in three African samples using average spring layout. Nodes represent ADNM-4 items, and edges Regularized partial correlations with LASSO penalty. Distances among nodes and thickness of edges relate to the size of their partial correlations. Blue edges indicate positive relations and Red edges indicate negative relationships. ADNM 1: Sense of burden; ADNM 2: Constant memories; ADNM 3: Difficulties concentrating, ADNM 4: Work/tasks difficulties. The full items can be found in Table

### **Authors contribution**

- Yafit Levin, PhD - Substantial contributions to the conception and design of the work, analysis, interpretation of the work, drafting and revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Rahel Bachem, PhD - Substantial contributions to the conception of the work, interpretation of the work, drafting and revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Thanos Karatzias, PhD - Substantial contributions to the design of the work, interpretation of the work, revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Mark Shevlin, PhD - Substantial contributions to the design of the work, revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Andreas Maercker PhD - Substantial contributions to the conception of the work, revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- Menachem Ben-Ezra, PhD - Substantial contributions to the conception and design of the work, revising the work in all stages, final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

### **Data Availability Statement**

The data that support the findings of this study are available from the corresponding author, YL, upon reasonable request.