Article

Confabulations in Alcoholic Korsakoff's Syndrome: A Factor Analysis of the Nijmegen–Venray Confabulation List

Assessment
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Abstract

Confabulations generally refer to the emergence of memories of experiences and events that, in reality, never took place, and which are unintentionally produced. They are frequently observed in alcoholic Korsakoff's syndrome. The aim of the current study was to validate the Nijmegen–Venray Confabulation List (NVCL), an observation scale for quantifying both spontaneous and provoked confabulations. The NVCL was completed for 252 patients with alcoholic Korsakoff's syndrome. Exploratory and confirmatory factor analyses were conducted to test three- and four-factor models of the NVCL structure. A four-factor model (provoked confabulations, spontaneous confabulations, severity of spontaneous confabulations, and distorted sense of reality) fitted the data better than the initially proposed three-factor model (provoked confabulations, spontaneous confabulations, memory, and orientation). The new instrument is therefore referred to as the NVCL-R. We encourage clinicians to include the assessment of confabulations in the neuropsychological examination, and to do so with validated instruments such as the NVCL-R.

Keywords

alcoholic Korsakoff's syndrome, confabulation, spontaneous, provoked, assessment, factor analysis, amnesia

Confabulations refer to the emergence of memories of experiences and events that, in reality, never took place (Wernicke, 1900), and which are unintentionally produced. Different forms and classifications of confabulations have been distinguished (for an overview, see Schnider, 2008). Kopelman (1987) proposed to focus attention on the evocation of the confabulations. Therefore, he distinguishes between provoked and spontaneous confabulations. Provoked confabulations correspond to what historically is referred to as momentary confabulations (Bonhoeffer, 1901, 1904). Provoked confabulations (or momentary confabulations) are incorrect verbal expressions, typically produced by amnesic patients in response to questions and appear to be plausible (Nahum et al., 2012). For example, when asked what he did yesterday, a patient might tell that he went to visit his mother, although he did not. Diverse underlying mechanisms have been proposed (such as executive dysfunctions, gap filling, disorientation, and increased temporal context confusion), which all explain relatively low proportions (Nahum et al., 2012). Spontaneous confabulations, on the other hand, occur in the context of severe amnesia and disorientation without any obvious trigger. These confabulation are linked to temporal-order confusion and patients have been reported to act on these ideas (Schnider, 2008; Schnider et al., 1996). For example, a patient might pack his belongings and request to leave to go to work in the middle of a conversation, while he is currently unemployed. Confabulations have been described in a variety of patients with memory disorders, including patients with Alzheimer's disease, ruptured aneurysms of the anterior communicating artery, traumatic brain injury, and encephalitis (Baddeley & Wilson, 1986; Cooper et al., 2006; El Haj & Larøi, 2017; Nahum et al., 2010; Nedjam et al., 2004; Talland et al., 1967; Weinstein & Lyerly, 1968; for a review, see Schnider, 2008). Yet patients with alcoholic Korsakoff's syndrome are most noted for their confabulation behavior.

Korsakoff's syndrome is a neuropsychiatric disorder, which results from nutritional (thiamine) depletion, typically following years of chronic alcohol abuse. The syndrome is

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known for the disproportionate learning and memory impairments. In addition, executive dysfunction, apathy, flattened affect, and confabulations are present (Arts et al., 2017). In the *Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition* (*DSM-5*; American Psychiatric Association, 2013), confabulations are even incorporated in the diagnosis of alcoholic Korsakoff's syndrome, as the diagnosis is changed to "Alcohol-induced major neurocognitive disorder, amnestic confabulatory type" (p. 291.1; see also Walvoort et al., 2016).

Only a few assessment tools have been developed for assessing confabulation in clinical practice. The Confabulation Battery (Dalla Barba, 1993) and the Provoked Confabulation Test (PCT; Cooper et al., 2006) have been developed to measure question-provoked confabulations. During the administration of the Confabulation Battery and PCT, patients are asked to answer several questions, including some that they cannot know the answer to. For example, "Do you remember what you did on March 13, 1985? (Confabulation Battery)" and "What ward does the doctor work on?" (PCT, when only a picture card of a doctor was presented to the participant). Answers other than "I don't know" on such items are considered to reflect provoked confabulations. As these instruments only quantify provoked confabulations, and standardized instruments that also assess spontaneous confabulation behavior were lacking, we developed the Nijmegen–Venray Confabulation List (NVCL, Rensen et al., 2015). The NVCL is an observation scale developed for quantifying both spontaneous and provoked confabulations. This is the first tool taking into account the distinction between spontaneous and provoked confabulations, which includes items assessing the categories "spontaneous confabulations," "provoked confabulations," and "memory and orientation." The items were constructed on the basis of a literature search, expert opinions, and evaluation of professional caregivers. Several items were formulated that covered all aspects of spontaneous confabulations, asking about the content and coherence of the confabulations and acting on confabulations. In order to asses other related aspects of confabulation, items on provoked confabulations, as well as orientation and memory were also included. In Rensen et al. (2015), more detailed information is provided on the item selection and scale development of the NVCL and the NVCL is compared with other confabulation assessment tools (Confabulation Battery and PCT) and related to other neuropsychological tests assessing memory and executive function.

Although the initial results on the psychometric properties of the NVCL in a sample of only 52 patients were promising, with a "good" to "excellent" internal consistency and interrater agreement, more in-depth research is needed in a larger sample to establish the psychometric quality of the scale. Performing a factor analysis might be particularly helpful to examine whether the distinction between the three categories is actually valid. The main aim of the current study was to further examine the psychometric properties of the NVCL, by performing factor analyses in a large group of patients with alcoholic Korsakoff's syndrome. It was hypothesized that a three-factor model (spontaneous confabulations, provoked confabulations, memory and orientation), as proposed in our article (Rensen et al., 2015), would fit the data best.

Method

We report how we determined our sample size, all data exclusions and all measures in the study.

Participants

The NVCL was completed for 252 patients with alcoholic Korsakoff's syndrome (194 men; *M*age = 61.2 years; range 37-82 years). The data were collected at the Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders of Vincent van Gogh Institute for Psychiatry in Venray, The Netherlands, and from four nursing homes across the Netherlands specialized in care for patients with alcoholic Korsakoff's syndrome: Atlant (Beekbergen), MeanderGroep (Kerkrade), Korsakoff Centre Slingedael (Rotterdam), and ZorgAccent (Hellendoorn). The Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders specializes in assessing alcohol-related cognitive disorders. Mostly postacute patients are admitted to the Centre. The mean time since admittance to the Centre was 1.9 months (*SD* = 0.9). Subsequently, patients with alcoholic Korsakoff's syndrome living in long-stay care facilities were recruited from the nursing homes, presumably representing a more chronic sample of patients with alcoholic Korsakoff's syndrome. The total sample of this study is representative for the Korsakoff population in the Netherlands, as it includes patients at various stages of the Korsakoff spectrum (from postacute to chronic). The mean time since admittance to the nursing homes was 78.8 months (*SD* = 63.2). All patients were at least 6 weeks abstinent from alcohol at the time of the assessment. Level of education was measured within the Dutch educational system using a 7-point rating scale, ranging from 1 (*less than primary education*) to 7 (*university degree*). The patients had a median education level of 4 (range 1 to 7).

To be eligible for inclusion, patients had to meet the *DSM-5* criteria for Alcohol-induced Major Neurocognitive Disorder, amnesic-confabulatory type (291.1; American Psychiatric Association, 2013), established by neuropsychological assessment, and be diagnosed as having alcoholic Korsakoff's syndrome in accordance with the criteria outlined in Kopelman (2002), which includes evidence of a history of malnutrition or thiamine deficit. The data included in this article were obtained in compliance with the Helsinki

Table 1. Descriptive Statistics for All Original 20 Items of the Nijmegen–Venray Confabulation List (NVCL-20), Based on the Responses of a Group of 28 Patients With Alcoholic Korsakoff's Syndrome.

Items	*M*	*SD*
Item 1. Does the patient confabulate spontaneously? Does (s)he spontaneously tell stories that are incorrect with respect to time and/or place	2.52	1.34
Item 2. How often does the patient spontaneously confabulate?	1.85	1.06
Item 3. Is the content of the confabulations realistic? Would someone who does not know the patient believe him/her (does the patient want to go out to work, or does (s)he tell you that (s)he has a meeting with the Queen?)	1.61	0.95
Item 4. Does the patient tell you or others that (s)he has an appointment with others (family, doctor) when this is not the case?	1.66	0.98
Item 5. Does the patient tell you or others that (s)he had visitors who in fact never visited him/her?	1.30	0.71
Item 6. Does the patient believe to be somewhere else than where (s)he actually is?	1.38	0.92
Item 7. Are the confabulations coherent stories, or are they difficult to follow and highly associative?	1.80	0.93
Item 8. Can the patient be corrected when telling these stories?	2.67	1.47
Item 9. Does the patient recognize acquaintances correctly?	1.38	0.70
Item 10. Does the patient show incorrect familiarity ("recognize" strangers, or mistake people for someone else)?	1.24	0.64
Item 11. Does the patient see or hear things that are not present?	1.22	0.61
Item 12. When the patient is being asked about the reason for admittance, does he/she respond correctly?	2.86	1.53
Item 13. When the patient is being asked what (s)he did yesterday, does (s)he answer correctly?	3.46	1.29
Item 14. When the patient is being asked about plans for the day or the next weekend, does the patient answer correctly?	3.41	1.32
Item 15. When the patient is being asked about something (s)he does not remember anymore, does (s)he admit this?	2.92	1.31
Item 16. Does the patient act upon his/her confabulations? Does (s)he for example walk to the door to wait for somebody or does (s)he get up during a conversation to take care of the dog?	1.37	0.80
Item 17. How often does the patient act or want to act upon the confabulations?	1.27	0.72
Item 18. Is the patient well oriented to place?	2.08	1.11
Item 19. Is the patient well oriented to time?	2.82	1.39
Item 20. Is the patient capable of remembering things, such as names of other patients or appointments?	3.07	1.35

Declaration. Data were collected as part of routine clinical assessments and as part of data collected for another study (Rensen et al., 2019).

Materials and Procedure

The NVCL is an observation scale consisting of 20 items, as displayed in Table 1. The items cover various aspects of three a priori defined categories: Spontaneous confabulation (Items 1, 2, 3, 4, 5, 7, 10, 16, and 17), provoked confabulation (Items 13, 14, and 15), and memory and orientation items (Items 6, 12, 18, 19, and 20). In our previous study, Items 8, 9, and 11 did not contribute to any of the subscales (Rensen et al., 2015). We decided, however, to keep these items in the scale for future research. Internal consistency was good to excellent for provoked confabulations (lambda 2 = 0.75) and excellent for spontaneous confabulations (lambda 2 = 0.91; see Rensen et al., 2015).

Professional caregivers (i.e., nursing staff) who knew the patients well rated the confabulation behavior on a 5-point rating scale, with higher scores reflecting more confabulations. In the current study, the scoring system was revised. The caregivers first had to read the instructions, which emphasized the purpose of the instrument, namely, to assess provoked and spontaneous confabulations. Instructions were provided about completing the instrument, for example: "Please encircle the answer that is most appropriate for the behavior of the patient at the time of completing the observation scale." It took about 5 to 10 minutes to complete the observation scale.

Statistical Analyses

We tested the data set for suitability for factor analyses by doing a Kaiser–Meyer–Olkin Measure of Sampling Adequacy test. The Kaiser–Meyer–Olkin returned a value of 0.88, showing our sample was adequate for factor analyses. First, an exploratory factor analysis (EFA) was conducted. Factor loadings were estimated with the principle axis method, and the factor structure was rotated by the promax method. Small coefficients (absolute value less than .30) were suppressed. Statistical significance was defined at $p < .05$. The EFA was conducted using SPSS version 25.

Subsequently, we conducted confirmatory factor analyses (CFA) to test the three-factor model of the NVCL data as proposed in our article (Rensen et al., 2015) and the

Table 2. Factor Loadings for the Exploratory Factor Analysis of the Original Nijmegen–Venray Confabulation List (NVCL-20), Based on the Scores of 252 Patients Diagnosed With Alcoholic Korsakoff's Syndrome.

	Factor loadings			
Items	1	2	3	4
Item 1. Does the patient confabulate spontaneously? Does (s)he spontaneously tell stories that are incorrect with respect to time and/or place	—	—	1.035	—
Item 2. How often does the patient spontaneously confabulate?	—	—	.760	—
Item 3. Is the content of the confabulations realistic? Would someone who does not know the patient believe him/her (does the patient want to go out to work, or does (s)he tell you that (s)he has a meeting with the Queen?)	—	.379	—	—
Item 4. Does the patient tell you or others that (s)he has an appointment with others (family, doctor) when this is not the case?	—	.815	—	—
Item 5. Does the patient tell you or others that (s)he had visitors who in fact never visited him/her?	—	.752	—	—
Item 6. Does the patient believe to be somewhere else than where (s)he actually is?	—	—	—	.667
Item 7. Are the confabulations coherent stories, or are they difficult to follow and highly associative?	—	—	—	—
Item 8. Can the patient be corrected when telling these stories?	—	—	.614	—
Item 9. Does the patient recognize acquaintances correctly?	.353	—	—	—
Item 10. Does the patient show incorrect familiarity ('recognize' strangers, or mistake people for someone else)?	—	—	—	.355
Item 11. Does the patient see or hear things that are not present?	—	.565	—	—
Item 12. When the patient is being asked about the reason for admittance, does he/she respond correctly?	.662	—	—	—
Item 13. When the patient is being asked what (s)he did yesterday, does (s)he answer correctly?	.829	—	—	—
Item 14. When the patient is being asked about plans for the day or the next weekend, does the patient answer correctly?	.832	—	—	—
Item 15. When the patient is being asked about something (s)he does not remember anymore, does (s)he admit this?	—	—	—	−.375
Item 16. Does the patient act upon his/her confabulations? Does (s)he for example walk to the door to wait for somebody or does (s)he get up during a conversation to take care of the dog?	—	.729	—	—
Item 17. How often does the patient act or want to act upon the confabulations?	—	.489	—	—
Item 18. Is the patient well oriented to place?	.725	—	—	.332
Item 19. Is the patient well oriented to time?	.852	—	—	—
Item 20. Is the patient capable of remembering things, such as names of other patients or appointments?	.736	—	—	—

model resulting from the EFA. Acceptable model fit was indicated by (1) a normed chi-square value (χ^2/df [degrees of freedom]) of less or equal to 2 for a good fit, and acceptable fit was indicated by values between 2 and 3; (2) a comparative fit index (CFI) value greater than .90 (Browne & Cudeck, 1993; Kline, 2011; Schermelleh-Engel et al., 2003); and (3) root mean square error of approximation (RMSEA) values of .05 for a good fit, .08 for an acceptable fit, and .10 or more a poor fit. The CFA analyses were performed with maximum likelihood estimation. The CFAs were conducted using AMOS version 25.

Results

Exploratory Factor Analyses

Descriptive statistics of the 20 items of the NVCL are provided in Table 2. All 20 items were included in the EFA. The analysis yielded four factors with an eigenvalue greater than 1, as outlined in Table 2 and Figure 1. Factor 1 was interpreted as measuring provoked confabulations (Items 9, 12, 13, 14, 18, 19, 20). This first factor explained 34.6% of the variance in the overall set of variables. Factor 2 was interpreted as an index of spontaneous confabulations (Items 3, 4, 5, 11, 16, 17), and explained 14.0% of the variance. Factor 3 was interpreted as a measure of the severity of spontaneous confabulations (Items 1, 2, 8) and explained 7.1% of the variance. Factor 4 contains items reflecting a distorted sense of reality (Items 6 and 10) and explained 5.3% of the variance. The cumulative variance explained by the four-factor model was 61.0%

Confirmatory Factor Analysis

The first CFA, testing the three-factor model of the NVCL as proposed in Rensen et al. (2015), yielded a poor goodness of fit ($\chi^2/df = 4.68$, CFI = 0.81, RMSEA = .121). The modification indices were high (MI >12) between Items 1

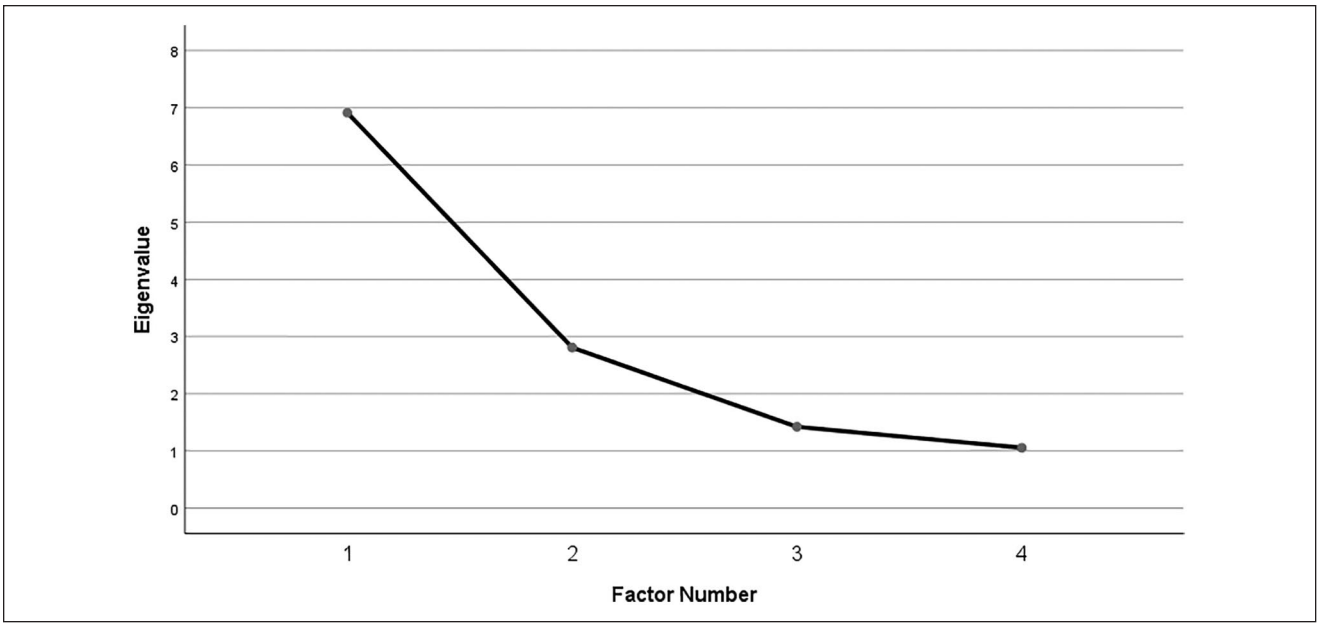

Figure 1. The eigenvalues per factor from the explenatory factor analysis.
Note. The factors were interpreted as follows: Factor 1 = provoked confabulations, Factor 2 = spontaneous confabulations, Factor 3 = severity of spontaneous confabulations, and Factor 4 = distorted sense of reality.

and 2, 16 and 17, 13 and 15, and 6 and 19. After correcting for this, the fit improved to fairly acceptable: ($\chi^2/df = 2.96$, CFI = 0.90, RMSEA = .088). The factor structure and factor loadings are presented in Figure 2.

The second CFA, testing the four-factor model from the EFA, resulted in a better goodness of fit than the three-factor model from our original paper. The normed chi-square value, CFI index, and the RMSEA value all fell in the ranges for an acceptable fit ($\chi^2/df = 2.63$, CFI = 0.91, RMSEA = .08). We found high modification indices between Items 16 and 17 (MI = 42.44) and Items 13 and 14 (MI = 14.24). We added those covariances to the model. After this, the parameters improved ($\chi^2/df = 2.14$, CFI = 0.94, RMSEA = .067). The factor structure and factor loadings are presented in Figure 3. A negative factor loading was found for Item 15 (=.375), which contradicts the theoretical background of this factor. That is, patients who scored high on the factor "distorted sense of reality," would score low on this item, indicating that they often/always admitted to not remember things. As this was regarded implausible, we deleted this item.

Adjustments to the Observation Scale

After examination of the results and reevaluating the scale, adjustments were made to the NVCL, resulting in a revised version: the Nijmegen–Venray Confabulation List–Revised (NVCL-R). Table 3 provides an overview of the factors and items of the revised scale. The most important adjustments are in sum:

- The NVCL-R consists of four different scores: Spontaneous confabulations (former items 2, 4, 5, 11, 16, and 17; current items: 1 to 6), severity of spontaneous confabulations (former items 1, 2, and 8; current items 7 and 8), provoked confabulations (former items 9, 12, 13, 14, 18, 19, 20; current items 9 to 16), and distorted sense of reality (former items 6 and 10; now items 17 and 18).
- The total confabulation score was dropped, as no single underlying factor was found.
- In the previous version of the NVCL, the scores ranged from 1 to 5, resulting in somewhat confusing minimum scores (e.g., a minimum score of 9 for spontaneous confabulations and a minimum score of 3 for provoked confabulations). In the updated version, scores ranged from 0 to 4, resulting in minimum scores of 0 for all categories.

Discussion

Provoked and spontaneous confabulations have been described in a variety of patients with memory disorders, and especially in patients with alcoholic Korsakoff's syndrome. Unfortunately, to date instruments with proper psychometric properties to examine this phenomenon are lacking. The aim of the current study was to further validate the NVCL, a brief and easy to administer observation scale for quantifying both spontaneous and provoked confabulations, by examining its factor structure. A four-factor model fitted the data better than the initially proposed three-factor model in Rensen et al.

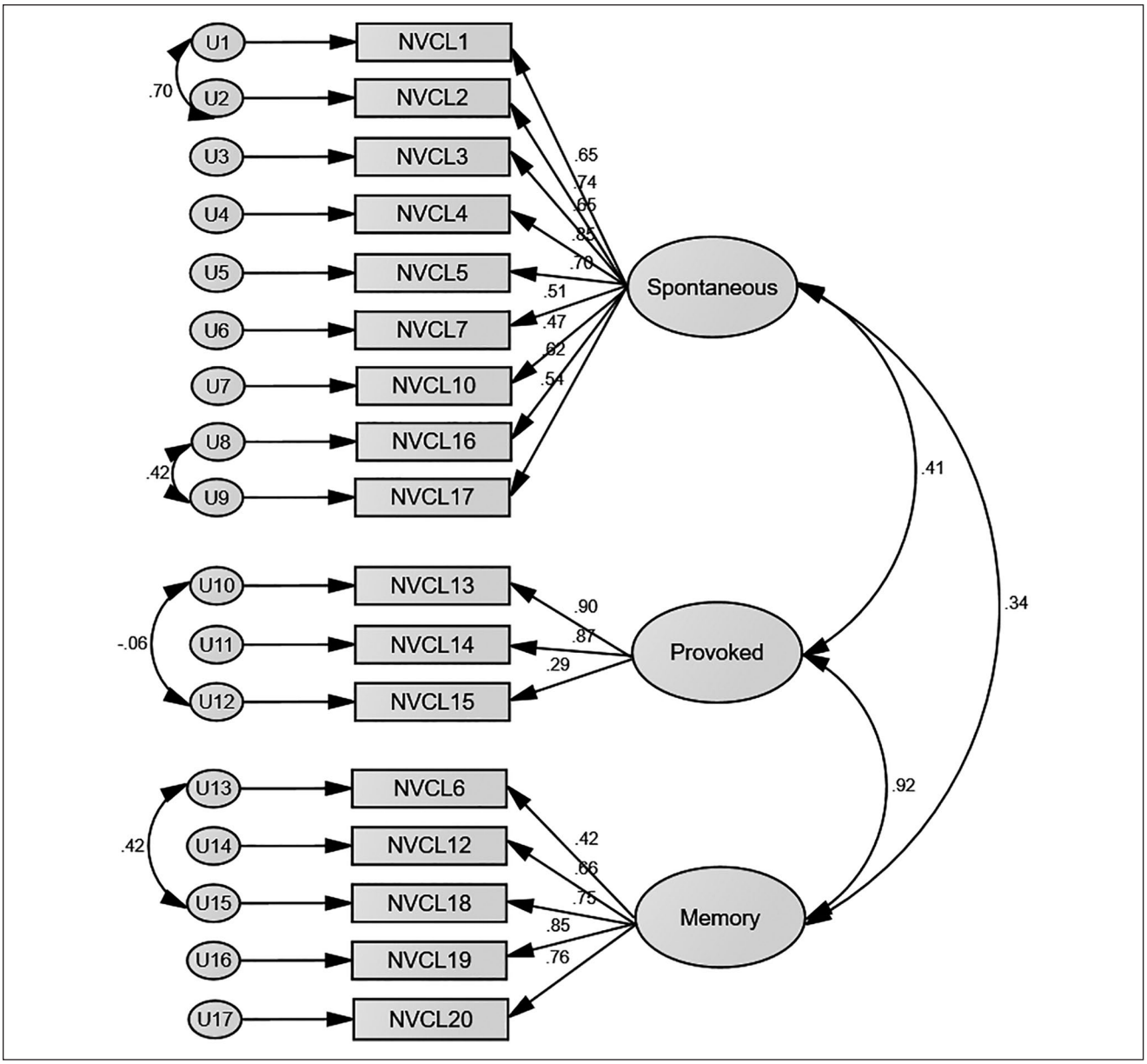

Figure 2. Three-factor model of the (Nijmegen–Venray Confabulation List) NVCL.
Note. NVCL1 to NVCL20 = the individual items; U1 to U17 = error variables; latent factors: Spontaneous = spontaneous confabulations, Provoked = provoked confabulations, Memory = memory and orientation. The loading for each item is shown above the arrow between the item and the latent factor. Two-headed arrows between ellipses represent the correlation coefficients among the three factors.

(2015). The factors in the revised version of the scale were categorized as: provoked confabulations, spontaneous confabulations, severity of spontaneous confabulations, and distorted sense of reality. Two items did not fit any of the scales and where left out of the revised instrument. Therefore, we will refer to the revised observation scale as the NVCL-R (see Supplemental Material for availability).

The NVCL was developed as a standardized measure for quantifying both provoked and spontaneous confabulations. The factors "provoked confabulations" and "spontaneous confabulations" hold up in the model with the best fit. However, there are shifts in items per factor. The current factor "provoked confabulations" consists of seven items in total, and now includes three items that initially belonged to the "memory and orientation" category (Items 18, 19, and 20). This is in agreement with the notion that provoked confabulations are often seen in and linked with amnesia (Schnider, 2008) and with Kopelman's (1987) description, that "provoked confabulation may represent a normal response to a faulty memory" (p. 1486). The items forming

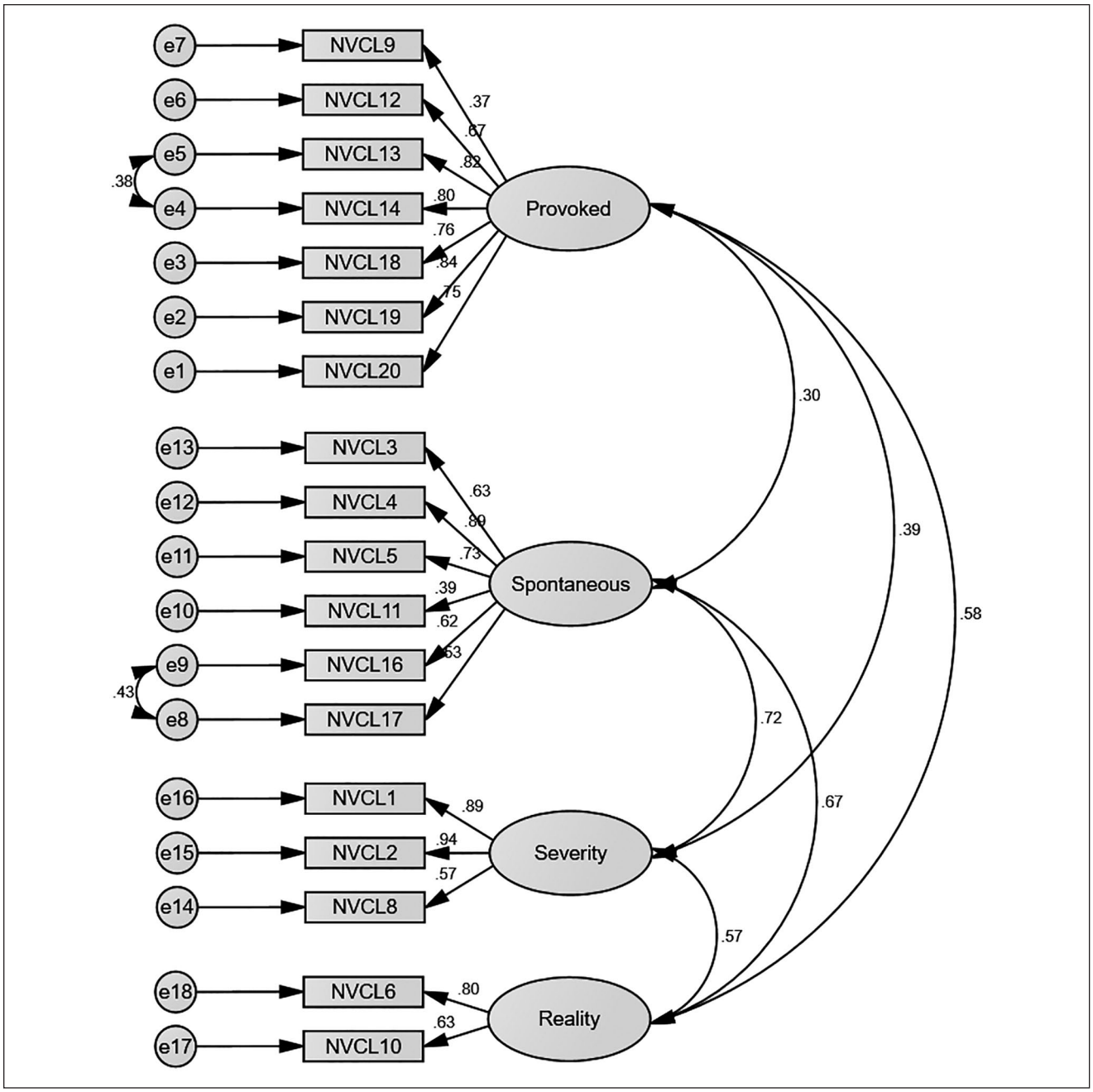

Figure 3. Four-factor model of the Nijmegen–Venray Confabulation List (NVCL).
Note. NVCL1 to NVCL20 = the individual items; E1 to E17 = error variables; latent factors: Provoked = provoked confabulations, Spontaneous = spontaneous confabulations, Severity = severity of spontaneous confabulations, Reality = distorted sense of reality. The loading for each item is shown above the arrow between the item and the latent factor. Two-headed arrows between ellipses represent the correlation coefficients among the four factors.

spontaneous confabulations in the model with the best fit are in accordance with Schnider's definition (2008) of behaviorally spontaneous confabulations, which emphasizes the combination of confusion in reality (Items 3, 4, 5, and 11) and acting on these false ideas (Items 16, 17). There are resemblances between spontaneous confabulation and delusions, and some theories can be applied to both confabulations and delusions (see Metcalf et al., 2007; Turner & Coltheart, 2010). Delusion is commonly defined as a false belief and associated with psychiatric illness like schizophrenia, whereas confabulation is typically described as a false memory and associated with neurological disorders

Table 3. Overview of the Factors and Items of the Nijmegen–Venray Confabulation List–Revised (NVCL-R).

Factor 1: Spontaneous confabulations
Item 1. Is the content of the confabulations realistic? Would someone who does not know the patient believe him/her (does the patient want to go out to work, or does (s)he tell you that (s)he has a meeting with the Queen?)
Item 2 Does the patient tell you or others that (s)he has an appointment with others (family, doctor) when this is not the case?
Item 3. Does the patient tell you or others that (s)he had visitors who in fact never visited him/her?
Item 4. Does the patient see or hear things that are not present?
Item 5. Does the patient act upon his/her confabulations? Does (s)he for example walk to the door to wait for somebody or does (s)he get up during a conversation to take care of the dog?
Item 6. How often does the patient act or want to act upon the confabulations?
Factor 2: Severity of spontaneous confabulations
Item 7. Does the patient confabulate spontaneously? Does (s)he spontaneously tell stories that are incorrect with respect to time and/or place
Item 8. How often does the patient spontaneously confabulate?
Factor 3: Provoked confabulations
Item 9. Can the patient be corrected when telling these stories?
Item 10. Does the patient recognize acquaintances correctly?
Item 11. When the patient is being asked about the reason for admittance, does he/she respond correctly?
Item 12. When the patient is being asked what (s)he did yesterday, does (s)he answer correctly?
Item 13. When the patient is being asked about plans for the day or the next weekend, does the patient answer correctly?
Item 14. Is the patient capable of remembering things, such as names of other patients or appointments?
Item 15. Is the patient oriented to time?
Item 16. Is the patient oriented to place?
Factor 4: Distorted sense of reality
Item 17. Does the patient believe to be somewhere else than where (s)he actually is?
Item 18. Does the patient show incorrect familiarity (“recognize” strangers, or mistake people for someone else)?

like alcoholic Korsakoff’s syndrome (Langdon & Turner, 2010). Whether confabulations and delusions are on the same continuum, or whether these are two largely independent concepts remains unclear. Spontaneous confabulations differ from psychosis. To summarize, the current findings on the NVCL-R are in line with prominent definitions of provoked and spontaneous confabulations.

Two new subscales were identified in the four-factor model: the severity of spontaneous confabulations and distorted sense of reality. “Severity of confabulations” contains questions on the frequency (Items 1 and 2) and perseverance (Item 8) of spontaneous confabulations. Future studies might examine whether this factor might be related to the effectiveness of confabulation rehabilitation strategies or the burden of spontaneous confabulations for caregivers working with the patients and family members. “Distorted sense of reality” consists of the following two questions: “Does the patient believe to be somewhere else than where (s)he actually is?” and “Does the patient show incorrect familiarity (‘recognize’ strangers, or mistake people for someone else)?”. These items were included as spontaneous confabulation is strongly associated with disorientation. Patients with spontaneous confabulation behavior are always disoriented, and recovery from spontaneous confabulation behavior is normally accompanied by recovery of orientation, even when amnesia persists (Nahum et al., 2009; Schnider, Ptak, van Däniken, & Remonda, 2000). The scales of the NVCL-R can be used to monitor whether this applies to individual patients.

The dissociation of confabulatory phenomena is still contested (for an overview, see for instance Schnider, 2008). Several authors have suggested that spontaneous confabulations and provoked confabulations are different expressions of the same underlying cognitive deficit, with spontaneous confabulations covering the more severe end of the continuum (Dalla Barba, 1993; Dalla Barba et al., 1999). However, there is strong evidence that these concepts concern two different deficits, each with its own neurocognitive mechanisms (Nahum et al., 2012). The NVCL is the first assessment tool that incorporates and seizes this distinction. The items were carefully selected based on expert opinion and face validity to capture unique aspects of provoked and spontaneous confabulations. Hence, it might not be surprising that the factor analysis in the current study confirms the existence two distinct factors (provoked and spontaneous confabulations), as it was designed to capture these phenomena. However, in our previous study (Rensen et al., 2015), we found that both spontaneous and provoked NVCL-20 confabulation scores showed similar correlation patterns. This raised the question whether the scores actually reflected distinct phenomena, and whether spontaneous and provoked confabulations are distinct phenomena. The results from the current study support and extend previous findings on this topic (Nahum

et al., 2012) substantiating the dissociation between spontaneous and provoked confabulations.

A prominent theory interprets confabulations as a problem of source monitoring (Johnson et al., 1993). Source monitoring refers to all processes involved in making attributions about the origins of memories, knowledge, and beliefs. Impaired internal monitoring (distinguishing between placing objects in a box versus imagining placing objects in a box) was found in patients with alcoholic Korsakoff's syndrome (El Haj et al., 2017). In addition, shortcomings in processing spatial and temporal order information in memory are present in this patient group (Brion, de Timary, Pitel, & Maurage, 2017; Postma et al., 2006). Hence, the sourcing of memories—where, when, how, or by whom, an event happened—may be confused or be incorrect in patients with alcohol Korsakoff's syndrome, and consequently may result in confabulations. Moreover, confabulations do not only cover spatial and temporal order information but are particularly linked to episodic autobiographical memory. The content of confabulations often, but not exclusively, consists of personal information, habits and routines, and overlearned information (Dalla Barba et al., 1999; La Corte et al., 2010). Several studies have reported a temporal gradient in autobiographical memory in patients with Korsakoff's syndrome (Kopelman et al., 1999; Rensen et al., 2017), showing that more remote memories are better preserved than more recent memories. The combination of autobiographical memory impairments, strategic retrieval deficits, source monitoring problems and spatiotemporal confusion may explain why the confabulation behaviour in KS is often related to the patients' personal past (see also Borsutzky et al., 2008). Furthermore, false statements about activities or plans that lie in the future (e.g., as measures by Item 13 of the NVCL) may also be the result of a diminished specificity in future thinking (El Haj et al., 2019) or impaired prospective memory (Altgassen et al., 2016).

A recommendation for future research is to explore the relation between confabulations and the performance on source monitoring tasks (in particular, internal monitoring tasks, such as used in El Haj et al., 2017). In addition, the distinction between provoked (or momentary) confabulations and spontaneous confabulations should be taken into account in these studies in such studies. By contrast, (behaviourally) spontaneous confabulations result from a specific mechanism, namely, orbitofrontal reality filtering, which is distinct from source monitoring (Schnider, 2013).

Confabulations are a characteristic clinical symptom of alcoholic Korsakoff's syndrome (Borsutzky et al., 2008). It has even been adopted in the clinical diagnostic guidelines of the syndrome, as the diagnosis in the *DSM-5* is referred to as "Alcohol-induced major neurocognitive disorder, amnestic confabulatory type" (291.1; American Psychiatric Association, 2013). The NVCL-R is a feasible instrument for quantifying both spontaneous and provoked confabulations, with good psychometric properties. This is the first assessment tool that accepts the distinction between the two confabulatory phenomena. A strength of the NVCL compared with existing confabulation assessment tools (PCT and Confabulation battery), is that scores can be obtained through the observation of caregivers. This makes it feasible for use in clinical practice as it does not burden the patient. Moreover, the scores on the NVCL-R reflect the patient's behavior in daily life, whereas traditional confabulation tools explore provoked confabulations in a test or laboratory setting. Observations by professional caregivers or relatives may offer a valid addition to the assessment of confabulatory behavior. Given the salient role of confabulations in alcoholic Korsakoff's syndrome, it is important to quantify confabulation behavior in a neuropsychological assessment and as part of outcome monitoring after treatment, and to do so with validated instruments such as the NVCL-R.

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Supplemental Material

Supplemental material (the NVCL-R) for this article is available online.

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