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How well do you think you remember your personal past? French validation of the Autobiographical Recollection Test (ART) and exploration of age effect

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ABSTRACT

This study aimed to validate a French version of the Autobiographical Recollection Test (ART), a 21-item self-report questionnaire developed by Berntsen, D., Hoyle, R. H., & Rubin, D. C. (2019; The Autobiographical Recollection Test (ART): A measure of individual differences in autobiographical memory. *Journal of Applied Research in Memory and Cognition*, 8(3), 305–318) examining the subjective quality people attribute to their autobiographical memories. It measures seven distinct but correlated dimensions of memories' quality varying between individuals: vividness, narrative coherence, reliving, rehearsal, visual imagery, scene, and life-story relevance. 373 participants aged from 18 to 87 years old were invited to complete the questionnaire by rating on a 7-point Likert scale the degree to which they agree with each item. Demographic data and information about their perception of their memory functioning and satisfaction were also collected. Confirmatory factor analysis confirmed the initial seven-factor structure of the ART. Moreover, results showed desirable psychometric properties, with good internal consistency (.94) and test-retest reliability (.83). This scale was also correlated with participants' perception of memory functioning in daily life. However, there was no correlation with age, confirming prior studies showing that the subjective quality of autobiographical memories does not decline with age. This study thus provides proof of the good psychometric properties of the French version of the ART and promotes its use to explore the subjective quality of autobiographical memories in clinical populations.

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Introduction


Remembering autobiographical memories refers to the recollection of past personal experiences (Conway, 2005; Conway et al., 2004; Conway & Pleydell-Pearce, 2000). It plays an important role in the construction of our identity and guides our present and future behaviours. Moreover, it ensures the pursuit of goals and participates in establishing and maintaining social and family relationships. However, the way people recall autobiographical memories is subject to large interindividual differences (Palombo et al., 2018). Some people have the ability to retrieve a large number of specific details concerning their autobiographical experiences (LePort et al., 2012) whereas others have extremely poor memories while being cognitively healthy (Palombo et al., 2015). In addition, interindividual differences in autobiographical memory (AM) are not only quantitative. The subjective quality of memories such as vividness or the feeling of reliving the events while thinking about it also varies between individuals (Cui et al., 2007; Watkins, 2018).

Such subjective feelings are also important as people often use them to make memory decisions (e.g., reality monitoring, Johnson, 2006; Johnson et al., 1993). Moreover, they have been positively linked to psychological well-being (Werner-Seidler & Moulds, 2011), highlighting the clinical relevance of these subjective recollection experiences.

Also, there is not a direct link between the amount of detail and subjective feelings of remembering. For example, aging affects the amount of retrieved episodic details (e.g., in the Autobiographical Interview, Levine et al., 2002) but does not seem to influence subjective memory judgments, which are frequently of similar or higher magnitude for older than younger adults (Comblain et al., 2005; Folville et al., 2021). These data suggest that, as people age, they may tend to rely less on the amount of retrieved detail to make memory judgments (Folville et al., 2020). Next to this subjective quality attributed to memories, subjective memory complaints are not always linked to objective memory performance either (Derouesne et al., 1999; Minett et al., 2005). This raises

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the question of whether memory satisfaction is not rather linked to these phenomenological aspects of remembering. Given the importance of AM, taking into consideration all these interindividual differences in our evaluations appears essential to properly understand its functioning and provide help to people with memory complaints.

To date, however, most existing tools assessing AM involve the participant recalling personal and specific memories in as much detail as possible (e.g., Kopelman et al., 1989; Levine et al., 2002; Piolino, 2003). Such evaluations are time-consuming and require some expertise in the intensive coding procedure of participants' responses, which can be an obstacle to their use in clinical settings. Moreover, the evaluation criteria for these tasks generally focus on the specificity or richness of the memories recalled. The phenomenological experiences of remembering are very little taken into account. When it is the case (e.g., Levine et al., 2002; Piolino, 2003), these aspects are very limited and focused on the feeling associated with the specific events recalled, preventing us to get a clear idea of the individual stable tendencies in subjective remembering experience. Many questionnaires have also been developed to explore AM but they mainly focus on the frequency or type of forgetting. The subjective quality attributed to memories, when considered, is often focused on a single aspect of the phenomenological experience; e.g., the narrative coherence in the Awareness of Narrative Identity Questionnaire (Hallford & Mellor, 2017) or the recollection capacity in the Survey of Autobiographical Memory (Palombo et al., 2013). Consequently, we are still lacking validated tests that could provide information about the interindividual differences in the subjective quality attributed to autobiographical memories in a comprehensive way.

To address this issue, Berntsen et al. (2019) have recently introduced the Autobiographical Recollection Test (ART), a self-report 21-item questionnaire examining the subjective quality that people attribute to their autobiographical memories. The particularity of the ART is that it evaluates how well people think they remember past events in general and does not focus on specific events or memories of a period of time. More specifically, the 21 items are equally distributed in seven distinct but correlated components about memories' quality varying between individuals (3 items per component): *vividness*, *narrative coherence*, *reliving*, *rehearsal*, *visual imagery*, *scene*, and *life-story relevance*. The choice of this factorial structure was motivated by theoretical models and empirical research on AM. Indeed, vividness and reliving have long been shown to be key characteristics of the phenomenological experience of remembering (Conway & Pleydell-Pearce, 2000; Greenberg & Rubin, 2003; Tulving, 1985). Life story relevance and narrative coherence are also central elements of the definition of AM (Conway, 2005), as well as the experience of remembering provided by the ability to reconstruct the scene and to visualise oneself and the different elements present (Rubin &

Umanath, 2015). Finally, Berntsen et al. (2019) added a rehearsal component as autobiographical memories are often rehearsed for oneself or social communication (Walker et al., 2009). This seven-factor structure of the ART was then confirmed by confirmatory factor analysis, which also showed that these seven components were associated with a single underlying second-order factor. However, the seven-factor model met the most criteria for a good fit. Berntsen et al. (2019) also demonstrated good test-retest reliability for the full scale after a mean delay of 21 days ($r = .78$ and ranges from .57 to .77 for the different factors) and convergent validity ($r = .60$) with the episodic subscale of the Survey of Autobiographical Memory (Palombo et al., 2013). The ART also showed good internal consistency with Cronbach's alpha varying from .89 to .95 across studies.

Considering its clinical relevance, facility of administration, and desirable psychometric properties, the goal of this study was to validate a French version of the ART by confirming the factor structure proposed by Berntsen et al. (2019), the internal consistency of the scale and its subscales, and the test-retest reliability. Moreover, the correlations of the French ART with age were explored to examine whether aging is related to the subjective quality of memories. We also examined the correlations with participants' perception of memory functioning to see if these phenomenological aspects could better explain memory satisfaction in daily life than objective memory performance in traditional memory tasks.

Materials and methods

Participants

Sample size was determined a priori with a subject-to-item ratio of 10:1, which is a rule of thumb for factor analyses (Costello & Osborne, 2005). As the ART contains 21 items, a minimum of 210 participants had to be recruited. The survey was set online and shared on social networks for 30 days during which 245 participants completed it. Moreover, to ensure that the presentation format does not influence the results, 78 additional participants answered the questionnaire on paper and 50 others received the questionnaire via an experience-sampling smartphone application named m-Path (<https://m-path.io/>). Consequently, a total of 373 participants (301 female and 72 male) from 18 to 87 years ($M = 44.11$; $SD = 16.44$) took voluntary part in this study. Thirty-six percent were aged from 18 to 39 ($n = 134$), 46% from 40 to 59 ($n = 172$), and 18% from 60 to 87 ($n = 67$). Their average years of education were 15.03 ($SD = 3.36$). Out of the total sample, 108 answered the French ART a second time after a mean delay of 23.8 days ($SD = 4.30$, range from 21 to 46 days). Participants included in the current study must be French speakers, accept informed consent, and answer all the questions of the test. The study was approved by the local ethics committee.

Procedure and measures

Participants were first invited to read and accept the consent form online. Then, they had to answer a few socio-demographic questions concerning their age, gender, level of education, and professional status. Two additional questions about participants' perception of their memory functioning also had to be answered before completing the French version of the ART (only for the participants who answered online and via the mobile application; $n = 295$). More specifically, one question was related to memory satisfaction in daily life ("How satisfied are you with your memory in your daily life?") and the other referred to the comparison of their memory functioning to the general population ("Compared to the general population, how good is your memory?"). Participants had to answer these questions with a visual analogical scale from 0 to 100. Finally, they had to answer the 21 items of the French ART. The online, pencil-and-paper, and mobile app forms only differed in the presentation format. On the two formers, all 21 items were presented on the same page and participants had to rate the degree to which they agree with each of them (from strongly disagree to strongly agree) on a 7-point Likert scale. On the mobile application, items were presented one by one and participants had to determine their degree of agreement with a multiple-choice of 7 possibilities (strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, strongly agree).

French version of the ART

To create the French version of the ART, we used the back-translation method. More specifically, the questionnaire was first translated from English to French by the authors of this paper. This translation was then back-translated to English by a professional translator and sent to the original authors of the ART, who proposed some adjustments before validating this translation. The final version of the French ART is provided in supplementary material (Table S1).

Test-retest reliability

After fully completing the questionnaire, participants were asked if they agreed to be recontacted later to answer the ART items again, allowing an evaluation of the test-retest reliability. Again, this was only proposed to the participants who answered online and via the mobile application ($n = 295$). Among them, 108 agreed to complete the questionnaire a second time. As the mean delay between the two sessions in the original version of the ART was 21.80 days (Berntsen et al., 2019), we send the second questionnaire 3 weeks after the first completion to be consistent with what has been done in the original version, which is also the most frequently used delay according to the guidelines (Streiner et al., 2014).

Analyses plan

All analyses were performed with Jamovi (The jamovi project, 2021). The Shapiro–Wilk tests revealed a departure from normality for all the 21 items of the questionnaire but only three items (6, 13, and 14) were negatively skewed indicating that the distribution was left-skewed, and two of them (6 and 14) showed excessive kurtosis. Consequently, the nonparametric version of the tests was used for each analysis.

Before addressing the factor structure of the French ART, the Kruskal–Wallis test was performed to compare the results from the 3 presentation formats for each item to determine whether they have led to similar results and therefore could be gathered together for the next analyses. Considering the high number of comparisons, we corrected the significance level ($p < .05$) using a Bonferroni procedure.

Then, we performed the confirmatory factor analysis (CFA) to determine if the observed data replicate the seven-factor structure proposed by Berntsen et al. (2019). Furthermore, as for the original version, we also tested whether these factors were indicators of a single underlying second-order factor. We added the SEMLj module in Jamovi to perform the CFA with the Robust Weighted Least Squares method (WLSMV) to adjust the fit indices for non-normality (Brown, 2006). The conventional fit indices and cutoff criteria of structural analyses were used to attest that the model fits the data well (Hu & Bentler, 1999). More specifically, the Comparative Fit Index (CFI) and the Tucker–Lewis Index (TLI) must be at least .95, the Standardised Root Mean Square Residual (SRMR) indicates a good fit when it is under .08, and the Root Mean Square Error of Approximation (RMSEA) should be between zero and .08 to indicate an acceptable fit to the data (zero indicating a perfect fit, Browne & Cudeck, 1992).

Finally, correlational analyses were performed to explore the test-retest reliability and the link of the ART components with age and participants' perception of memory functioning. Internal consistency was also calculated with the McDonald omega's coefficient.

Results

Comparison between the results from the different presentation formats

Kruskal–Wallis test revealed no significant difference between the different presentation modes for any of the ART items (after the Bonferroni correction, α was set at $p = .002$; see supplementary material Table S2). Consequently, all the results were grouped together to perform the next analyses.

Confirmatory factor analysis and scale properties

The fit of the collected data with the original seven-factor model proposed by Berntsen et al. (2019) met all the indices' criteria necessary to confirm this factorial structure

(CFI = .99; TLI = .99; SRMR = .05; RMSEA = .07). Means, standard deviations, and factor loadings for each item are indicated in Table 1. Means are similarly high for all the items and factor loadings range from .46 to .90, with only three items under .70. Correlations between factors range from .36 to .80 (see Table 2) and they were all statistically significant with a p -value < .001, suggesting that the different facets of the ART do assess a common concept. Given the high correlation between the vividness and coherence factors (.80), we tested whether a bi-factor solution could be better. The fit indices were similar to the original seven-factor structure (CFI = .99; TLI = .99; SRMR = .05) except the RMSEA which showed a poorer fit (.08). The exploration of the single second-level factor model including all the items met several criteria for a good fit (CFI = .98; TLI = .98; SRMR = .07; RMSEA = .10) but, as in the original study, the best model was the one with the seven components.

Internal consistency and test-retest reliability

McDonald omegas' coefficient (ω) for the full French ART and its seven components are reported in Table 3. Internal consistency of the full French ART at time 1 is .94 and ranges from .73 to .85 for the different factors. This did not decrease over time since internal consistency for the full scale at time 2 was .96 and ranged from .73 to .91 for the different factors. Concerning the test-retest reliability ($n = 108$), the coefficient test-retest for the full scale is .83 and ranges from .72 to .80 for the different factors. All test-retest coefficients reached significance with $p < .001$.

Evolution with age and relations with the perception of memory functioning

Spearman correlations exploring the ART's relations with age and participants' perception of memory functioning

revealed no significant correlation between age and the full scale or the seven components of the French ART (after Bonferroni correction, α was set at $p = .002$). However, almost all the factors showed significant medium size correlations with how people consider their memory functioning compared to the general population. Concerning memory satisfaction in daily life, significant correlations of smaller size were found with 3 factors (vividness, coherence, and scene) and with the full scale. Results are indicated in Table 4.

Discussion

This study aimed to validate a French version of the ART, a self-report measure developed by Berntsen et al. (2019) assessing the understudied individual differences in remembering autobiographical memories. More specifically, given its clinical relevance and facility of administration, our goal was to confirm the seven-factor structure and replicate the good psychometric properties of the original version. CFA supported the idea that the experience of remembering autobiographical memories can actually be explored through seven distinct but inter-related components: *vividness*, *narrative coherence*, *reliving*, *rehearsal*, *scene*, *visual imagery*, and *life story relevance*. This seems to confirm that these are key characteristics of the AM phenomenology. Our results also indicate that the French ART has desirable psychometric properties, with good internal consistency and test-retest reliability. The former is similar to the original version (.94) and the latter is slightly better for the full scale (.83 vs. .78) and much better for the sub-factors (from .72 to .80 vs. .57 to .77).

Moreover, this study also aimed at exploring the correlations of this scale with age and participants' perception of memory functioning. The results showed an absence of age effect on the subjective quality of memories,

Table 1. Means, standard deviations, and factor loadings for all the items of the French Autobiographical Recollection Test.

Item	M	SD	Vividness	Coherence	Reliving	Rehearsal	Scene	Visual	Life story
1	4.76	1.46	.74						
8	4.81	1.47	.77						
15	4.82	1.47	.83						
2	5.05	1.36		.72					
9	4.96	1.42		.84					
16	4.29	1.60		.77					
3	4.77	1.63			.75				
10	4.62	1.68			.82				
17	4.81	1.55			.77				
4	5.07	1.53				.76			
11	4.54	1.71				.65			
18	4.23	1.68				.46			
5	5.21	1.38					.78		
12	4.99	1.44					.59		
19	4.86	1.50					.73		
6	5.53	1.31						.81	
13	5.36	1.30						.89	
20	5.04	1.48						.83	
7	5.52	1.43							.90
14	5.73	1.34							.70
21	4.80	1.63							.73

Table 2. Inter-factor correlations.

	Vividness	Coherence	Reliving	Rehearsal	Scene	Visual
Coherence	.80					
Reliving	.65	.58				
Rehearsal	.52	.38	.58			
Scene	.65	.61	.55	.44		
Visual	.69	.65	.66	.44	.74	
Life story	.50	.36	.50	.51	.43	.43

Table 3. Internal consistency and test-retest reliability for the full French ART and the different factors.

	Time 1 (w) (n = 373)	Time 2 (w) (n = 108)	Retest (n = 108)
Full ART	.94	.96	.83
Vividness	.80	.82	.80
Coherence	.80	.88	.75
Reliving	.81	.87	.74
Rehearsal	.65	.73	.74
Scene	.73	.80	.72
Visual	.85	.91	.75
Life Story	.76	.88	.75

which has already been observed multiple times with specific memory judgments about vividness for example (for a review, see Folville et al., 2021). None of the correlations with age is even of small size here (none of the $r_s > .10$). This observation is consistent with the dissociation between objective and subjective recovery in aging, with the accuracy and richness of memories decreasing while subjective memory judgments remain stable or even higher (Folville et al., 2020). However, another possible explanation for this absence of age effect could be a lack of sensitivity of the tool to age differences. This, however, should be confirmed with a larger sample of older participants.

In addition, the French ART and some of its subscales showed significant correlations with participants' perception of memory functioning, which is an indication of predictive validity. This result is encouraging since subjective memory complaints do not always correlate with performance on traditional clinical memory tests (Derouesne et al., 1999; Minett et al., 2005). ART may consequently be an alternative way to predict subjective memory satisfaction in everyday life, but this needs to be studied more deeply. Indeed, in the present study, participants' perception of memory functioning was based on two single items. Future studies should

explore if the same results are obtained with a more comprehensive evaluation of memory satisfaction in daily life. Moreover, the French ART should be administered to people with memory complaints or difficulties to explore its clinical interest and its discriminant validity. This could eliminate the skew deviation and excessive kurtosis that were present for 3 items as clinical populations will probably show greater variability.

Another point that remains to be determined is the convergent validity of the French ART. With the original English version, Nielsen et al. (2022) found no association with objective memory performances (free recall and forced choice about a movie) but the ART was correlated with confidence ratings and the subjective recollection of this movie (explored with some items of the ART adapted for this specific event). This correlation with the recollective qualities of specific events seems to generalise to personal autobiographical memories. Indeed, Gehrt et al. (2022) found significant associations between the ART and phenomenological characteristics of specific personal autobiographical events cued by word (evaluated with the Autobiographical Memory Questionnaire; Rubin et al., 2003). However, it is quite possible that the subjective feeling associated with a memory depends on the type of personal event that has to be remembered. Yet, the general nature of the ART does not allow us to take this into consideration. In clinical applications, it would be interesting to give indications before completing the questionnaire concerning the events we are interested in. We could even consider administering the ART several times asking patients to focus on different memories depending on their memory complaints (for example, events from different time periods or different types of events).

In conclusion, beyond the convergent and discriminant validity that remains to be demonstrated, this study validates the French version of the ART, a questionnaire exploring individual subjective experiences of remembering autobiographical memories in general. In addition to its good psychometric properties, this questionnaire shows several advantages such as its rapidity, easiness of administration, and correlations with the perception of memory functioning. Consequently, this questionnaire appears to be a relevant new tool to explore memory complaints in clinical populations.

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Table 4. Correlations (and p -value) of the French ART with age and perception of memory functioning.

	Age (n = 373)	Self-comparison to the general population (n = 295)	Satisfaction (n = 295)
Vividness	.09 (.07)	.38 (<.001)	.28 (<.001)
Coherence	.08 (.11)	.40 (<.001)	.27 (<.001)
Reliving	.10 (.04)	.24 (<.001)	.13 (.02)
Rehearsal	-.06 (.27)	.15 (.01)	.07 (.23)
Scene	-.02 (.72)	.31 (<.001)	.20 (<.001)
Visual	-.01 (.77)	.27 (<.001)	.17 (.003)
Life story	-.06 (.24)	.12 (.03)	.03 (.55)
Full ART	.03 (.54)	.32 (<.001)	.20 (<.001)

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