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REVIEW

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The adaptive ability performance test (ADAPT): A factor analytic study in clients with intellectual disabilities

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Abstract

Background: The adaptive ability performance test (ADAPT) was developed to assess adaptive skills in individuals with intellectual disabilities and borderline intellectual functioning, with or without mental disorders. As a follow-up to earlier research on the ADAPT, a factor analytic study was conducted.

Method: One thousand and sixty six ADAPTs from clients with (suspected) intellectual disabilities or borderline intellectual functioning and 129 ADAPTs from participants from the general population were collected along with other characteristics (e.g., IQ, psychiatric classifications, living situation).

Results: An exploratory factor analysis (EFA) was performed and resulted in good fit indices. Subsequent confirmatory factor analysis (CFA) and multigroup CFA showed acceptable to good fit indices. This resulted in an instrument with eight factors and 62 items.

Conclusion: Factor analytic results suggest that the ADAPT is a valid instrument that measures adaptive skills in individuals with intellectual disabilities or borderline intellectual functioning.

KEYWORDS
ADAPT, adaptive functioning, adaptive skills, borderline intellectual functioning, factor structure, intellectual disability

1 | INTRODUCTION

Since the introduction of the Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-5; American Psychological Association, APA, 2013), more attention has been paid to the importance of adaptive skills in defining an intellectual disability. The severity of an intellectual disability is now foremost determined on the basis of the severity of deficits in adaptive functioning, while the role of IQ is diminished (Schalock et al., 2010), compared to earlier versions of the DSM where the IQ score was leading in determining the severity of the intellectual disability. The same tendency is visible in the classification of borderline intellectual functioning. Borderline intellectual functioning is classified only if adaptive functioning problems arise as a result of lower intellectual functioning and care is therefore indicated (DSM-5; American Psychological Association, APA, 2013).

An important strength of identifying deficits in adaptive functioning is that (repeatedly) measuring adaptive skills facilitates that care is better matched to the needs of the client. Measuring adaptive skills is also useful to know which skills could be trained to help increase a client's independence (see e.g., Didden et al., 2021), and to monitor

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progress made by the client. Clients with mental health problems but without intellectual disabilities may also have problems regarding adaptive functioning (Matthews et al., 2021; Stiekema et al., 2020; Stravo et al., 2006). The ADaptive Ability Performance Test (ADAPT; see below) may thus also be indicated for these clients. The shift towards adaptive functioning at the expense of intellectual functioning presented a new challenge worldwide. As far as we know, available instruments for adaptive functioning did not yet measure all three domains of adaptive functioning and/or were not standardised sufficiently accurately to determine the severity of an intellectual disability. This was especially the case for clients with mild intellectual disability or borderline intellectual functioning (DSM-IV: IQ 50/55–84). They represent a relatively large percentage of people who are often dependent on professional support and healthcare as a result of societies becoming more complex (Woittiez et al., 2019).

Now that the level of the IQ no longer solely determines the severity of the intellectual disability, but the severity of the problems in adaptive functioning, more research needs to be done in this area in clients with mild intellectual disability or borderline intellectual functioning. The question is also whether this target group shows deficiencies with the same adaptive skills as clients with a lower intellectual functioning level.

Until recently, in the Netherlands two instruments were used to measure adaptive skills in adults with intellectual disability. First, the Social Self-Help Scale-Plus (Sociale Redzaamheid Schaal-Plus; SRZ-P; Kraijer & Kemna, 2004) was a short proxy instrument developed in 1981, but the skills included in the SRZ-P are partly outdated and the latest reference data stem from 1997. Second, the Dutch language version of the Vineland Adaptive Behaviour Scales-Second Edition (Vineland-II; Sparrow et al., 2005; Dijkxhoorn & Verhaar, 2012) was also widely used. It is an extensive semi-structured interview that measures the social and practical domain of adaptive functioning, and is particularly suitable for clients with (very) low intellectual and adaptive functioning levels. Training is required to use the instrument.

Besides these two instruments, other questionnaires are in use in the Netherlands that have problems that hinder a quick and valid assessment of adaptive functioning. The Vineland-3 (Sparrow et al., 2016) was published in the Netherlands in 2021, but there are no Dutch norms yet. Although the items have been modernised, the questionnaire is mainly suitable for clients with (very) low intellectual and adaptive functioning levels. Skills from this observation instrument are, for example, 'spontaneously babbles' or 'is potty trained during the day'. These skills are not relevant to measure independency in clients with higher functional levels, such as clients with mild intellectual disabilities or borderline intellectual functioning. In 2020, the Dutch version of the ABAS-3 (Harrison & Oakland, 2015) was published which can serve as an observation tool for the three domains of adaptive functioning, but the standardisation of the ABAS-3 is based on data from a general population and is minimally validated on clients with intellectual disabilities or borderline intellectual functioning. Also, in the ABAS-3 no distinction has been made between scores for clients with associated mental health problems, while mental health problems are very common in clients with intellectual disabilities (Jonker & Nijman, 2021). Furthermore, the ABAS-3 is quite extensive and uses complicated language, making it difficult for some referees and clients to understand.

To address the limitations of the above instruments, the ADAPT was developed. During the development of the ADAPT, the conditions set by the AAIDD for the development of an instrument that measures adaptive functioning were taken as a starting point (Schalock et al., 2010). Similar to all instruments that assess adaptive functioning, the ADAPT is an observation instrument that is completed by proxies. The instrument was especially developed for adults with relatively high levels of adaptive functioning (i.e., mild intellectual disabilities and borderline intellectual functioning). For this group, skills such as using social media, using a mobile phone and keeping a job are relevant. The emphasis was on collecting data from this client target group rather than on people from the general population. The psychometric qualities of the ADAPT were investigated in three studies (Jonker et al., 2021; Kruisdijk et al., 2019; Nijman et al., 2017). The internal consistency of the total scale was found to be very high. Modest but significant associations were found with outcomes of intelligence tests, which is in line with the idea behind the DSM-5 (APA, 2013) that cognitive skills and adaptive functioning are two different concepts that are positively but moderately related to each other. The concurrent validity with the SRZ-P (see above) was found to be high. Additionally, we found that people in the general population achieved significantly higher ADAPT scores on all items than clients with (suspected) intellectual disabilities and borderline intellectual functioning. Also, higher ADAPT scores are associated with higher levels of education, while lower scores are associated with increasing levels of (professional) support that clients receive.

Now that the validity and reliability of the total scores of the ADAPT have been explored, the present study is focused on the factor structure of the ADAPT. The DSM-5 (APA, 2013) and AAIDD (Schalock et al., 2010) emphasise that adaptive functioning is divided into 10 skills and three overarching domains, namely a conceptual, social and practical domain (Tassé et al., 2012). Based on a large dataset of clients from more than 60 healthcare institutions in the Netherlands, we wanted to further evaluate the (concept and construct) validity of the ADAPT by examining how the 65 items of the ADAPT cluster in underlying factors.

2 | METHOD

2.1 | Setting and participants

Between January 2018 and December 2019, a multi-centre study was conducted. This was a convenience sample consisting of 1366 clients with a (suspected) intellectual disability receiving support or treatment from a large number of Dutch mental healthcare facilities. An inclusion criterion was that clients were aged 16 years or older. Clients with (co-morbid) mental disorder(s) were included except for those with a florid psychosis. Clients with florid psychosis (or otherwise severely

TABLE 1 Sample characteristics

Gender	***N* = 1495**	**886 men (59%); 609 women (41%)**		
Age	*N* = 1475	Mean = 37.4 year	Range 16–82	SD = 15.06
IQ	*N* = 915	Mean = 65.8	Range 40–113	SD = 12.46
Educational level	*N* = 1306	Primary education		*N* = 551 (42%)
		Secondary or tertiary education		*N* = 755 (58%)
		Education for people with ID (primary and secondary)		*N* = 847 (65%)
Psychiatric diagnosis	*N* = 1495	689 None (46%)	Autism	*N* = 253 (17%)
		806 One or more (54%)	Substance abuse	*N* = 175 (12%)
			Personality disorder	*N* = 145 (10%)
			Psychotic disorder	*N* = 128 (9%)
			PTSD or anxiety disorder	*N* = 119 (8%)
			ADHD Mood disorder	*N* = 109 (7%)
				N = 100 (7%)
Housing situation	*N* = 1254	Independently		*N* = 161 (13%)
		Ambulatory support		*N* = 201 (16%)
		Facility daytime support		*N* = 46 (4%)
		24-h residential or treatment		*N* = 662 (53%)
		With parents		*N* = 184 (15%)

Note: SD, standard deviation; *N*, number of participants.

disrupted clients) were excluded because these conditions may (temporarily) impair adaptive functioning. In addition, we collected data of 129 volunteers from the general population in order to obtain reference scores of people who function adaptively independently in society (Jonker et al., 2021). This resulted in an overall sample size of 1495 participants.

In the total sample, there were slightly more men than women, which can be explained by the participation of forensic institutions in this study, in which proportionally more men reside. Clients had a mean age of 37.4 years. The mean total IQ of clients for whom an IQ score was known was 65.8. All Dutch school levels were represented: the lowest primary school level for children with moderate intellectual disability up to tertiary education at a university level. Eight hundred and forty seven clients had followed primary or secondary education for people with an intellectual disability. More than half of the participants (54%) had one or more psychiatric diagnoses. Of the 1254 participants whose housing situation was known, most (*N* = 909; 72%) received professional care; a minority of clients (*N* = 184; 15%) lived with parents at home or independently without any supervision (*N* = 161; 13%). The characteristics are depicted in Table 1.

2.2 | Procedure

For the collection of (anonymized) ADAPT data permission was obtained from the Ethics Committee Social Science (ECSS; 2018-122) of the Radboud University, Nijmegen, the Netherlands. Facilities for clients with intellectual disabilities, mental health care and forensic institutions and prisons were approached to participate in the study. Due to the need for an instrument to measure adaptive functioning, institutions self-applied after they heard of the study from other organisations. Ultimately, more than 60 organisations located throughout the Netherlands participated. After an organisation applied to participate in the study, the first author gave verbal and written instructions about how the data collection had to be performed. The ADAPTs were completed by proxies (caregivers or adult [household] family members) who had detailed insight into the client's daily functioning and adaptive skills, and in multiple contexts, such as home, school, work and the community. Eventually, 1366 ADAPTs were collected from clients who received care or treatment from an organisation. In addition, ADAPT scores were collected from 129 participants from the general population. An adult family member was asked to complete the ADAPT for these 129 participants (i.e., individuals without intellectual disabilities).

2.3 | Adapt

The ADAPT was developed to measure skills in three domains (i.e., conceptual, social, and practical) of adaptive behaviour in adults and consists of 65 items. Examples of items of the ADAPT are: [the client]

- gets up on his/her own and on time
- prepares an evening meal
- handles money responsibly
- uses social media
- fills in a form or sends a legible email
- does not allow him/herself to be persuaded to do activities he/she regrets later
- travels independently by public transport
- adapts flexibly to changes
- shows insight into own limitations

Each of the 65 items can be scored on a 5-point Likert-scale from 1: 'does not perform the skill, even with help' to 5: 'performs the skill completely independently'. Caregivers or family members should score the items on the basis of actual behaviour of the client, and not on what the client potentially is capable of. The total ADAPT score ranges between 65 and 325. In case of a low item score (i.e., 1 or 2), proxies are asked to also indicate whether a client could potentially acquire that skill, for example by training.

2.4 | Statistical analysis

Demographic characteristics were analysed using descriptive statistics in SPSS version 25.

For factor analyses, we first performed an exploratory factor analysis, followed by a confirmatory factor analysis and multi-group confirmatory factor analysis. The sample was randomly split in a test set (exploratory sample) and a trainset (confirmatory sample), where clients and volunteers were also randomly assigned to the two sets.

As the scale is newly developed we first ran an exploratory factor analysis with MPlus version 8.5 (Muthén & Muthén, 1998), oblique rotation, with the mean and variance-adjusted weighted least squares (WLSMV) estimator (Hull et al., 2019), as this is a robust estimator, recommended for categorically ordered variables that could potentially have a non-normal distribution (Gomez et al., 2019). Decisions on the number of factors to retain were based on a parallel analysis in R version 4.1.1 (R Core Team, 2014) with the psych package version 2.1.9 (Revelle, 2020) and a scree plot with eigenvalues above 1 (Field, 2013). There were five criteria based on which it was decided whether an item or factor should be kept, removed or modified in the ADAPT:

- Items had to have a factor loading above 0.21. This is considered to be sufficient with a sample size above 600 (Field, 2013, p. 681);
- Items that loaded on two or more factors (called cross loadings) and had almost similar loadings which did not exceed 0.4 were placed under the factor that was most suitable in terms of theoretical content (e.g., item 6 about eating healthy);
- If items loaded on two or more factors and the factor loadings exceeded 0.4 the item was removed to maintain a simple factor structure (Hull et al., 2019), although other cut-off points might be used as well (do Egito et al., 2018; Gomez et al., 2019) (e.g., item 29 about traffic-safety);
- In the case of exceptionally high correlations (above 0.80), we removed one of the two items;
- Factors had to have a minimum of three items to be retained (Gomez et al., 2019; Tabachnick & Fidell, 2012).

As a second step, we performed a confirmatory factor analysis, which should preferably be applied to questionnaires for which the factor structure is validated and which is based on theory and empirical evidence to test the conceptual validity of the model (Byrne, 2013). In categorically ordered CFA's, it is recommended to also assess local fit using indices such as the residuals and modification indices. This is done because changes in fit indices such as the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) might be biased (Liu et al., 2017). It is recommended to report the Tucker-Lewis index (TLI), the standardised root mean square residual (SRMR), and RMSEA (Putnick & Bornstein, 2016; Vandenberg & Lance, 2000). A lower bound of 0.90 is necessary for adequate fit, while indices above 0.95 are considered 'good' fit for CFI and TLI (Vandenberg & Lance, 2000). Note that Hu and Bentler (1999) suggest that CFI and TLI should be close to 0.95, RMSEA should preferably be lower than 0.06 while the SRMR should be close to 0.08 to obtain relatively good fit.

As a third and last step, we investigated whether the ADAPT is generalizable, that is whether a new set of users interprets the ADAPT in a similar way. This was done with a multi-group CFA, in which the test and train set were compared (multi-group measurement invariance). Questionnaires can be used to compare groups (over time) and to measure some underlying construct (Van de Schoot et al., 2012). These constructs should preferably have a similar meaning between groups (Putnick & Bornstein, 2016), which can be assessed by measurement invariance (MI). MI implies that latent constructs can be compared, the instrument performs similarly in both groups (Vandenberg & Lance, 2000), and that participants interpret the questionnaire (and the questions and constructs) similarly (Van de Schoot et al., 2012). Generally, three increasingly strict levels of invariance are tested: (1) configural invariance, which implies the same factor structure in both groups; (2) metric invariance, which implies the same factor structure as well as equal loadings across groups; and (3) scalar invariance, which implies the same factor structure as well as equal loadings and intercepts. If strong/scalar invariance is established, this would allow comparison of means or sums of factors over time (Van de Schoot et al., 2012). As categorical items provide less information on factor loadings, we only test for scalar invariance to compare the means between (future) groups (Millsap, 2011).

To investigate multi-group measurement invariance, we applied the rule that the difference in CFI may not exceed 0.015 (Brierley et al., 2020).

Taken together, we conducted an EFA, CFA and MG-CFA. First, the total sample of 1495 participants was randomly split in a train set ($N = 748$) and a test set ($N = 747$). The train set was used to conduct the EFA, while the test set was used to validate the model with a CFA. Finally, a MG-CFA was conducted.[1]

3 | RESULTS

3.1 | Exploratory factor analyses (EFA)

To investigate the factor structure of the ADAPT, an EFA (with oblimin rotation) was performed based on the first split half of the

[1]The output of the analysis can be found on the Open Science Framework (OSF): https://osf.io/yw634/?view_only=7a44da41fb45477f87799921e9423a37.

TABLE 2 Oblimin factor correlations

	1	2	3	4	5	6	7	8	9
1	1.000								
2	0.483*	1.000							
3	0.303*	0.449*	1.000						
4	0.287*	0.450*	0.541*	1.000					
5	0.337*	0.198*	0.089*	0.044	1.000				
6	0.406*	0.445*	0.507*	0.468*	0.347*	1.000			
7	0.461*	0.457*	0.433*	0.402*	0.262*	0.634*	1.000		
8	0.261*	0.307*	0.286*	0.231*	0.063	0.265*	0.198*	1.000	
9	0.227*	0.127	0.116	0.054	0.193*	0.087	0.140*	0.010	1.000

Note: * significant at 5% level.

dataset: the train set ($N = 748$). Fit indices were good (CFI = 0.974, TLI = 0.966, RMSEA = 0.037, SRMR = 0.024). The EFA provided a factor solution consisting of nine scales. The parallel analysis indicated that nine factors should be retained, while the eigenvalues indicated that eight factors were adequate.

Factor correlations (see Table 2) are in the medium to high range (Hull et al., 2019). Subsequently, the factor loadings of the 65 items were inspected (see Table 3). All main factor loadings were above the 0.21 cut-off.

Four items with high cross loadings were placed under the factor with the second highest loading. This was done because the content of the items fitted better under a different factor. Item 6 ('Eats healthy…') was removed from the factor 'Daily structure and schedule' and placed under the factor 'Basic self-care, hygiene and responsible eating'. Item 21 ('Has arranged necessary insurance for him/herself…') was removed from the factor 'Society skills' and placed under the factor 'Dealing with money, mail and insurance'. Item 36 ('Takes care of him/herself in case of illness or accident') was also removed from the factor 'Society skills' and placed under the factor 'Making responsible choices' which also contains the correlated item 'Follows the advice of a doctor/healthcare worker in case of illness or accident'. Item 65 ('Adapts flexibly to changes') was removed from the factor 'Making responsible choices' and placed under the factor 'Social alignment' because having to be flexible usually stems from attuning with others.

The ninth factor consisted of one item (Item 29 'Is safe in traffic in a quiet or familiar area') and this was the only item in the ADAPT with cross loadings above 0.4 on two factors. Item 29 had a significant overlap with item 30 ('Is safe in traffic in a busy or unfamiliar area'). Item 29 was therefore excluded, also because this item differentiated less for the severity of an intellectual disability. Even at the lowest IQ levels, that is with clients with a moderate intellectual disability, most clients performed this skill (almost) independently.

Items 16 ('Makes a realistic estimate of the price of food') and 17 ('Makes a realistic estimate of the price of larger goods'), and 31 ('Travels independently with public transport') and 32 ('Makes responsible use of public transport chip card') had very high correlations (>0.8). Items 17 and 32 were therefore excluded as their content was fairly similar. We also reasoned that the public transport chip card is typically used in The Netherlands and less relevant for the use of the ADAPT outside the Netherlands.

After the adjustments were made, eight factors remained with a total of 62 items. The eight scales were assigned scale labels by the authors of the instrument (Jonker & Nijman) based on the content of the items that compose them. The names chosen for the eight scales are:

1. Basic self-care, hygiene and responsible eating (7 items),
2. Household skills (6 items),
3. Society skills (7 items),
4. Social alignment (9 items),
5. Applying school skills (8 items),
6. Dealing with money, mail, and insurance (4 items),
7. Daily structure and schedule (5 items),
8. Making responsible choices (16 items).

3.2 | Confirmatory factor analyses (CFA)

After all the adjustments described above, the fit of the new solution of eight factors was tested with a CFA on the confirmatory sample (i.e., test set; $N = 747$). This resulted in moderately good fit-indices (CFI = 0.907, TLI = 0.902, RMSEA = 0.067, SRMR = 0.059). To investigate the small degree of misfit, we inspected the modification indices of the model to assess (large) influences from items or factors. Modifications to improve the fit can be based on the modification index (MI) and the (standardised) expected parameter change (SEPC). The CFA modification indices showed that the largest index came from items 8 and 9 (MI = 347.46; SEPC = 0.30). These items both measure aspects of tidying up and cleaning up the house, and also have a high correlation ($r = .78$). The second largest index came from items 16 and 18 (MI = 260.91; SEPC = 0.27; $r = .74$), which were assigned to separate factors, and both relate to handling money in a store. The largest value for the SEPC were item 42 on factor 8 (MI = 142.79; SEPC = 1.15) and again item 16, but now with factor 3 (MI = 103.08; SEPC = 0.97). The inspection of the MIs thus indicates that some modifications might result in increased model fit.

TABLE 3 Factor loadings of all ADAPT items

Abbreviated item	Hygiene	House	Society	Social	School	Money	Structure	Responsible	Factor 9
1. Getting out of bed	**0.256***	−0.044	0.011	0.023	0.099*	0.155*	**0.528***	0.027	0.171*
2. Dental care	**0.696***	0.107*	0.003	−0.003	0.049	−0.043	0.044	0.136*	0.018
3. Clothing care	**0.795***	−0.007	−0.003	0.072*	0.130*	−0.072	0.099*	0.019	−0.009
4. Hair care	**0.836***	0.097*	0.029	0.053	0.135*	−0.125*	−0.033	−0.013	0.010
5. Nail care	**0.659***	**0.217***	0.177*	−0.006	0.113*	−0.074*	−0.126*	0.022	0.011
6. Eat healthy	**0.292***	**0.217***	−0.028	0.085*	0.018	−0.077*	**0.349***	0.183*	−0.122*
7. Sleeping pattern	0.142*	0.050	−0.036	−0.023	0.045	0.071*	**0.652***	0.093*	−0.006
8. Tidying up the house	**0.644***	−0.004	−0.072*	0.052	−0.090*	**0.348***	**0.246***	−0.004	0.080*
9. Cleaning the house	**0.652***	0.071*	0.043	0.062*	−0.122*	**0.336***	0.072*	0.079*	0.053
10. Wash clothes	**0.357***	**0.423***	0.022	0.023	0.057	**0.234***	−0.007	−0.120*	0.121*
11. Do the dishes	**0.314***	**0.392***	−0.133*	0.121*	−0.063	**0.235***	0.191*	0.001	0.189*
12. Shopping for a meal	0.066*	**0.658***	0.112*	0.017	0.049	0.096*	−0.038	0.047	0.095*
13. Make breakfast/lunch	0.114*	**0.572***	−0.046	0.043	0.048	−0.091*	0.337*	0.093*	0.055*
14. Make dinner	0.077*	**0.811***	0.035	0.057*	−0.002	−0.048	0.026	0.070*	−0.061*
15. Doing home repairs	0.065	**0.369***	**0.276***	0.134*	0.015	**0.231***	−0.043	0.006	−0.053
16. Estimate food prices	−0.156*	**0.316***	0.080*	0.114*	**0.369***	**0.467***	−0.082*	0.094*	0.042
17. Estimate price larger goods	−0.103*	**0.259***	0.128*	0.103*	**0.351***	**0.449***	−0.087*	0.131*	−0.014
18. Calculate change	−0.030	0.155*	0.171*	0.053	**0.394***	**0.385***	0.011	0.071	−0.068*
19. Handling money	0.144*	−0.012	**0.229***	0.028	0.104*	**0.336***	0.035	**0.291***	−0.064
20. Dealing with mail	0.098*	0.033	0.173*	0.049	**0.256***	**0.304***	0.094*	**0.277***	−0.122*
21. Has arranged insurance	0.202*	−0.046	**0.349***	0.077*	0.114*	**0.316***	−0.154*	**0.255***	−0.151*
22. Internet banking	**0.217***	−0.097*	**0.519***	0.112*	0.143*	0.173*	−0.136*	0.167*	−0.170*
23. Read simple text	0.044	−0.008	−0.011	0.101*	**0.840***	−0.032	−0.004	0.035	−0.014
24. Read complicated text	−0.015	0.012	0.070*	0.089*	**0.636***	0.090*	−0.019	**0.211***	−0.206*
25. Writes own name	0.137*	0.098*	0.069	0.068	**0.752***	−0.073*	−0.076*	−0.077*	0.034
26. Fill in form or send mail	0.052	0.060*	**0.263***	0.053	**0.552***	0.019	−0.052	0.138*	−0.132*
27. Tell the time	0.026	−0.007	−0.048	−0.017	**0.821***	0.056	0.090*	0.022	0.114*
28. Knows which month it is	0.075*	0.022	−0.005	−0.054	**0.809***	0.055	0.118*	0.001	0.095*
29. Traffic-safe in a known neighbourhood	0.057	0.118*	**0.433***	0.007	**0.242***	−0.004	0.006	0.072	**0.469***
30. Traffic-safe in an unknown neighbourhood	0.056	0.138*	**0.555***	0.014	0.152*	0.042	−0.076*	0.074*	**0.303***
31. Public transport	−0.021	0.057*	**0.981***	0.017	−0.017	0.050*	0.043*	−0.110*	−0.017
32. Public transport chip card	0.013	0.028	**0.886***	−0.037	0.023	−0.039*	0.119*	0.041	0.058*
33. Meaningful day schedule	−0.063*	0.053	0.177*	0.120*	0.015	−0.096*	**0.758***	0.068*	−0.015
34. Job or school	0.010	0.141*	**0.407***	0.008	0.056	−0.054	**0.341***	**0.210***	−0.035
35. Self-entertainment	−0.007	0.112*	0.164*	0.209*	0.107*	−0.076*	**0.457***	0.161*	−0.047
36. Self-care in case of illness	**0.237***	0.148*	**0.310***	0.133*	0.062	0.064*	−0.019	**0.239***	−0.090*
37. Follow doctor's advice (incl. Medicine use)	**0.218***	0.033	**0.227***	0.062	0.067	−0.009	0.085*	**0.376***	0.013
38. Make contact	0.002	−0.041	−0.032	**0.847***	0.076*	0.011	0.030	−0.082*	0.083*
39. Be hospital	0.087*	0.105*	0.012	**0.745***	−0.044	0.020	0.019	0.012	0.033
40. Have a chat	−0.030	0.014	−0.069*	**0.884***	0.104*	−0.002	0.084*	−0.031	−0.097*
41. Understand non-verbal signals	0.049	0.064	0.061	**0.547***	−0.064	0.073*	−0.142*	**0.253***	−0.057
42. Help others	0.078*	0.089*	0.092*	**0.628***	−0.180*	0.028	0.060	0.085*	0.082*
43. Table manners	**0.288***	0.017	−0.021	**0.410***	0.067	−0.093*	0.000	0.202*	0.157*
44. Follow news	−0.073	0.070	0.049	0.179*	**0.317***	0.088*	**0.296***	0.166*	−0.064*

TABLE 3 (Continued)

Abbreviated item	Hygiene	House	Society	Social	School	Money	Structure	Responsible	Factor 9
45. Use social media	0.076	0.085*	**0.395***	0.190*	**0.244***	−0.140*	−0.054	0.120*	−0.077
46. (Mobile) phone use	0.059	−0.011	**0.243***	0.178*	**0.266***	−0.068*	0.050	**0.269***	0.097*
47. Make appointments with healthcare providers	**0.213***	0.108*	**0.346***	**0.216***	0.078*	0.167*	−0.148*	0.147*	−0.091*
48. Using public areas	0.039	0.029	**0.311***	**0.250***	**0.262***	−0.018	−0.070*	0.154*	**0.217***
49. Ask questions in public	−0.065*	0.120*	**0.245***	**0.406***	0.194*	0.034	−0.052	0.126*	0.120*
50. Dealing with authority	0.012	−0.011	−0.019	0.124*	0.025	−0.086*	0.084*	**0.600***	**0.313***
51. Waiting for your turn	0.080*	0.028	0.094*	0.199*	0.071*	−0.083*	−0.133*	**0.494***	**0.351***
52. Has contacts with positive influence	0.022	0.039	0.033	**0.269***	−0.021	−0.093*	0.139*	**0.498***	0.019
53. Have friends	0.035	0.016	0.183*	**0.361***	0.020	−0.103*	0.088*	**0.313***	−0.114*
54. Being manipulable	0.063	−0.041	0.058	−0.114*	0.031	0.019	0.120*	**0.745***	−0.020
55. Healthy love relationships	0.069	0.130*	**0.262***	**0.265***	−0.033	−0.027	−0.050	**0.386***	−0.165*
56. Think before acting	−0.010	0.139*	−0.048*	−0.047*	0.087*	0.007	−0.005	**0.858***	−0.040
57. Problem solving	−0.046	0.159*	0.019	0.033	0.108*	0.025	−0.017	**0.760***	−0.074*
58. Acting wisely	0.022	0.095*	0.029	0.052	0.047	0.108*	0.031	**0.732***	−0.084*
59. Postpone needs	0.069*	−0.019	−0.079*	0.101*	0.035	0.135*	0.113*	**0.678***	0.060*
60. Inciting yourself to annoying obligations	0.187*	0.059	−0.053	0.206*	0.029	0.168*	0.204*	**0.333***	0.085*
61. Learning from mistakes	0.068*	0.010	0.034	0.092*	0.077*	0.018	0.087*	**0.672***	0.030
62. Knowing own limitations	0.094*	−0.024	0.078*	0.128*	−0.077*	0.021	0.087*	**0.603***	0.085*
63. Asking for advise	0.069*	−0.002	0.017	0.128*	0.005	0.000	0.121*	**0.560***	0.159*
64. Arriving on time	0.073	−0.075	0.090*	0.110*	0.147*	0.173*	**0.286***	**0.267***	**0.248***
65. Adapts flexibly	0.019	0.068	0.030	**0.336***	−0.059	0.036	−0.014	**0.394***	0.054

Note: The descriptions of the factors are abbreviations: Hygiene = Basic self-care, hygiene and responsible eating, House = Household skills, Society = Society skills, Social = Social alignment, School = Applying school skills, Money = Dealing with money, mail and insurance, Structure = Daily structure and schedule and Responsible = Making responsible choices. Items with significance are annoted with *; Items with loadings >0.21 are bold; Items assigned to a factor are shaded grey.

TABLE 4 Model fit indices of the CFAs (configural model and scalar model) for the ADAPT based on the total data set ($N = 1495$)

				Scaled chi-square difference test statistic						
	Chi-square model fit test statistic	*df*	*p*	Difference	*df* difference	*p*	CFI	TLI	RMSEA	SRMR
Model 1 (configural model)	15075.368*	3594	<.001	N/A	N/A	N/A	0.906	0.902	0.065	0.058
Model 2 (scalar model)	15017.717*	3830	<.001	57,651	236	.787	0.909	0.91	0.063	0.058

Note: *Significant at the <.001 level.

3.3 | Multi-group confirmatory factor analysis (MG-CFA)

To test for measurement invariance, a multi-group CFA was performed on the test and train set. Table 4 shows the statistical results of the multi-group CFA. Based on our preset criteria, the CFI indicated that measurement invariance is evident.

4 | DISCUSSION AND CONCLUSIONS

In 2016, we developed the ADAPT, an instrument that measures adaptive functioning on three domains (conceptual, social and practical) according to the AAIDD criteria of an intellectual disability (Schalock et al., 2010). Previous research into aspects of validity and reliability of the ADAPT yielded satisfactory to excellent psychometric characteristics, and reference values were established to help estimate

the severity of an intellectual disability (Jonker et al., 2021). This study extended these studies by exploring the factor structure of the ADAPT whereby EFA, CFA and multi-group CFA were performed.

The EFA resulted in good fit indices and a nine-factor solution for the questionnaire. Although some overlap was evident on factors, the items that loaded on multiple factors concerned skills valuable for clients to learn, as a result of which we decided to keep these items in the ADAPT. For example, the item 'Enters into and can maintain healthy love relationships' loads on the factors society skills, social skills and making responsible choices. For statistical reasons and in order to keep the scales as distinctive as possible, the item should be removed. However, based on the clinical relevance of this item in considering adaptive functions, the item was kept. This example illustrates the trade-off between statistical relevance and practical relevance. We reasoned that in clinical practice items cannot always be assigned to one of the eight factors but can fit under multiple factors. The item overlap between factors is also visible in the description of the three domains in the DSM-5 (APA, 2013). For instance, handling money is found in both the conceptual and practical domain. As such, it is unsurprising that we find correlations between factors.

After the EFA, scale labels were assigned to the remaining eight factors by the authors of the instrument (Jonker & Nijman) based on the content of the items that compose them. Now that scale scores can be calculated in addition to an ADAPT total score, this offers the possibility to describe strengths and weaknesses in adaptive skills performance for individual clients and thus to better tailor care to the client's support needs. It also allows for examining adaptive profiles of specific groups of clients, such as clients with comorbid autism or individuals with a genetic disorder.

A CFA on the ADAPT with eight factors and 62 items resulted in moderately good fit-indices. This means that even though we often favoured clinical relevance over statistical relevance, the statistical outcomes are still moderate to good. The CFA was followed by a multi-group CFA on the test and train set that showed that there is measurement invariance: new respondents interpret the questionnaire in a conceptually similar way. The outcomes of the EFA, CFA and MG-CFA make the ADAPT not only a clinically but also a statistically valid instrument.

In contrast to the AAIDD (Schalock et al., 2010), which refers to 10 factors in the context of adaptive skills, the ADAPT measures eight. The ADAPT does not measure language receptivity or the ability to speak. Also, the ADAPT does not measure motor skills. In contrast, the ADAPT contains a relatively large number of skills related to executive functioning in the factor 'making responsible choices'. These differences may have to do with how the ADAPT has been developed, and for which target group, compared to other instruments. The ADAPT originated in clinical practice with clients with a mild intellectual disability or borderline intellectual functioning. A group of clinicians selected which skills were relevant for this target group in distinguishing between more and less self-reliant clients.

The ADAPT may be complementary to available instruments for measuring adaptive skills in several ways. Compared to the Vineland II and 3, the ADAPT measures skills that are relevant in clients with higher functioning levels (i.e. clients with mild intellectual disabilities or borderline intellectual functioning). The Vineland-3 seems more suitable to investigate clients with (very) low functioning levels. In contrast to other instruments where the focus of the data collection is on the general population, the ADAPT has been studied in a large group of clients for whom the questionnaire is actually intended. This is according to the conditions that the AAIDD sets for a suitable instrument to investigate adaptive functioning (Schalock et al., 2010). Further, the ADAPT is a relatively short questionnaire with simply formulated items and instructions, which takes less time to complete than the ABAS-3 and Vineland-3, and is easier to understand for people with a mild intellectual disability or borderline intellectual functioning than, for example, the ABAS-3. For examining adaptive skills in a work situation, the ABAS-3 seems more appropriate because it is more detailed in this area than the ADAPT.

Besides several strengths, this study also has some limitations. First, the adaptive skills of the ADAPT are to some degree culturally determined, which limits the generalizability of its outcomes. Because the ADAPT has been studied in a Dutch population, future studies should be done cross-culturally. Another limitation is that slightly higher fit indices would be desirable.

For instance, we have reported on both the Chi-Square and the normed Chi-Square (as well as other fit indices). The Chi-Square index is sensitive to sample size and affected by larger samples above 200 (Alavi et al., 2020; Byrne, 2013). Therefore, the normed Chi-Square is often reported as a fit index, along with several other fit indices to obtain a holistic impression of goodness of fit (Alavi et al., 2020). The normed Chi-Square is the ratio between Chi-Square and the degrees of freedom, and values below 2 are indicative of excellent fit between the sample and hypothesized model. Acceptable values and guidelines vary somewhat from <5 to <2 (Schumacker & Lomax, 2004; Ullman, 2001), but the values in our study fall within this range (Alavi et al., 2020). However, these values do indicate that our model might be improved, which warrants further study. One approach that might be suitable is to adjust the model based on the largest modification indices. This would affect the estimates of the other indices, but could also be a viable strategy to increase the fit of the model.

In addition, future research may focus on developing an abbreviated version of the ADAPT, which for instance could serve as a screener for an intellectual disability or for examining progress in care and treatment (e.g., through Routine Outcome Monitoring). In a short version items that (strongly) correlate to each other can be removed, which gives us the opportunity to maximise the fit indices of the ADAPT. Future research could also focus on longitudinal data to investigate if and which adaptive skills improve during treatment (measuring sensitivity to change), and how long it takes for improvement to occur on average. With this information, targeted advice can be given to mental health care institutions on how long a client with intellectual disabilities should be in treatment to improve independency and for which skills permanent support is usually required. Finally, future research may focus on developing and testing a client

interview version. The simple language of the ADAPT makes the questionnaire potentially accessible to people with mild intellectual disabilities and borderline intellectual functioning. In the absence of a referent, the client could then be interviewed. The lack of a referent is not so much a problem in care for clients with an intellectual disability, but for example with immigrants with suspected intellectual disability who are without family. And also in forensic care, where clients can only show part of their skills due to for example detention and where clients and family have broken up so that there is no referent who can describe the client's functioning prior to imprisonment.

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CONFLICT OF INTEREST

The Dutch version of the ADAPT is published bij Hogrefe Publishers for which the first author receives royalties.

DATA AVAILABILITY STATEMENT

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

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