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A measure of functioning in adults With ADHD: Psychometric properties of the general life functioning scale-parent version

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Abstract

Objective: The General Life Functioning Scale (GLF) was developed to provide a complementary alternative to existing measures of impairment. We examined the psychometric properties of the GLF-Parent version (GLF-P), given the known value of informant ratings.

Methods: The GLF-P was administered to parents of adults with attention-deficit/hyperactivity disorder (ADHD) diagnosed in childhood and a nonADHD comparison group in the Pittsburgh ADHD Longitudinal Study. GLF-P ratings described 334 participants (ADHD = 186; comparison = 148) rated at age 25 (M_{age} = 24.80 years, SD_{age} = 0.46, range = 24–26) and 401 participants (ADHD = 237; comparison = 164) rated at age 30 (M_{age} = 29.30, SD_{age} = 0.64, range = 28–33). Exploratory (EFA) and confirmatory (CFA) factor analyses were used.

Results: EFAs suggested and CFAs confirmed a five-factor solution. We found measurement invariance across diagnostic and age groups, satisfactory internal consistency, construct validity, and known-group validity.

Conclusion: Psychometric results suggest the GLF-P as a helpful adjunctive measure of functioning. Further research is needed to determine the utility of the GLF across diverse

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT AND INFORMED CONSENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent forms have been collected.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

PEER REVIEW

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Keywords

attention-deficit/hyperactivity disorder (ADHD); confirmatory factor analyses (CFA); exploratory factor analyses (EFA); functional impairment; measurement invariance; psychometric evidence

1 | INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a pervasive, persistent, and impairing neurodevelopmental disorder (Barkley, 2015). Core symptoms of ADHD, including inattention, hyperactivity, and impulsivity, typically lead to impairments in home, school, and peer settings throughout childhood. These functioning difficulties often persist into adulthood (e.g., Gordon & Fabiano, 2019; Molina et al., 2018). For instance, adverse social, educational, occupational, financial, and marital outcomes have been documented (Erskine et al., 2016; Gordon & Fabiano, 2019; Pelham et al., 2020; also see reviews in Barkley, 2015). ADHD also places a significant burden on families and society in general (Doshi et al., 2012). Given the negative outcomes associated with ADHD, assessing functional impairment with evidence-based tools is vital.

Adverse functional outcomes are well-documented in self-referred clinical samples of adults with ADHD and prospective samples of individuals diagnosed with ADHD in childhood (Erskine et al., 2016; Gordon & Fabiano, 2019; Harstad et al., 2022). Even when not meeting the full criteria for ADHD diagnosis, most adults with childhood ADHD continue to experience ADHD symptoms and functional impairments (Sibley et al., 2012) and only 9% achieve full remission by age 25 (Sibley et al., 2021). Compared to their peers without histories of ADHD, adults with childhood ADHD are less likely to attend college or obtain advanced degrees, to secure or sustain full-time employment, and to be financially independent (Altszuler et al., 2016; Kuriyan et al., 2013; Pelham et al., 2020). ADHD-related financial deficits grow even larger as individuals age; individuals with childhood ADHD were projected to have much lower lifetime income and net worth at retirement (Pelham et al., 2020). In addition to poor educational, occupational, and financial outcomes, behaviors associated with ADHD often extend to social spheres. For instance, adults with ADHD have heightened rates of risky sexual behavior (Flory et al., 2006), drug and alcohol use and problems (Charach et al., 2011), and legal issues, such as police contact and incarcerations (Mohr-Jensen & Steinhausen, 2016). These wide-ranging functional impairments require effective assessment.

Despite the research on these specific outcomes of ADHD, only three measures assess the functioning of this population more globally within one measure and report satisfactory psychometric properties: the Weiss Functional Impairment Rating Scale–Self Report (WFIRS-S; Weiss, 2000), the Barkley Functional Impairment Scale (BFIS; Barkley, 2011) and the Impairment Rating Scale (IRS; Dawson et al., 2020). Although existing measures are clinically useful (Barkley, 2011; Canu et al., 2020; Dawson et al., 2020; Fabiano et al., 2006; Sibley et al., 2012; Weiss et al., 2018), two major considerations motivated the development and validation of the General Life Functioning Scale (GLF). First, there is a need for a measure that is available in both self-and other- reports. Obtaining

information from multiple informants, including parents, is recommended in large part because individuals with ADHD often underreport their symptoms (e.g., Sibley et al., 2012, 2021). It is also evident that parents continue to have significant involvement, such as providing housing and financial support (Altszuler et al., 2016). Psychometric properties of most existing rating scales have been examined via self-report in college students (e.g., Canu et al., 2020) and online crowdsourcing samples (e.g., Dawson et al., 2020). There is limited psychometric evidence of parent reports for general functioning at this age. Second, a measure that encourages ratings of functioning in relation to perceived age-based norms (for early adulthood in the current study) may be useful in the context of reticence to report a need for services (Edelbrock et al., 1999) and being asked to report about "difficulty" (e.g., BFIS) and "problems" (e.g., IRS, WFIS). Although measures like the IRS have demonstrated utility, a rating scale that fosters consideration of functioning relative to peers and avoids potentially stigmatizing language might be a useful adjunctive measure, especially in settings where patients tend to under-report their problems and are subject to stigma, such as individuals with ADHD (Hinshaw & Stier, 2008; Hoza et al., 2004; Tu et al., 2019).

A rating scale of functioning in various life domains was added to the Pittsburgh ADHD Longitudinal Study (PALS) in 2005 as a complement to the existing IRS that emphasized problems and the need for treatment in its instruction set. The new rating scale measure was written to include the following features: (1) emphasize ratings of functioning in relation to peers, (2) be available in self-and other-reported versions, and (3) be relatively brief despite expanding domains of function beyond those in the IRS. The GLF is an 18-item rating scale that assesses major domains of functioning such as work, interpersonal relationships, and general life satisfaction relative to peers. The current study specifically focuses on the psychometric properties of the parent-reported form given the lack of data on such properties for IRSs. Thus, we aimed to identify the factor structure and test the validity of the GLF-Parent Version (GLF-P; see Table S1, for a list of items). Moreover, the design of the PALS study provided an opportunity to explore invariance of factor structure across ratings of adults with, versus without, histories of ADHD, and across assessments at two different ages. To our knowledge, this is the first measure of global functioning in young adulthood to be evaluated using parent reports of adults with a valid and reliable *DSM* diagnosis of ADHD in childhood and their demographically comparable peers without ADHD histories.

2 | MATERIALS AND METHODS

2.1 | Participants

2.1.1 | The Pittsburgh ADHD longitudinal study—The ADHD group was recruited for a longitudinal study from a pool of eligible participants who met *DSM-III-R* or *DSM-IV* criteria for ADHD in childhood and were treated in the Summer Treatment Program at the Western Psychiatric Institute and Clinic from 1987 to 1996. During the baseline assessment in childhood, multiple informants provided diagnostic information: both parents and teachers completed the Disruptive Behavior Disorders rating scale (Pelham et al., 1992); parents also completed a semi-structured clinical interview. Two Ph.D.-level clinicians independently reviewed files and confirmed diagnoses. Of the 516 study-eligible children

diagnosed with ADHD, 364 enrolled in PALS an average of 8 years later at a mean age of 17 years. At the time of the first follow-up for the individuals with ADHD, 240 demographically similar adolescents and young adults without ADHD (M_{age} = 17 years), currently and historically and confirmed with parent report, were recruited from the greater Pittsburgh community (between 1999 and 2001) for longitudinal follow-up alongside the ADHD group. The resulting ADHD and comparison groups were equivalent on age, gender, race, and parental education. Both groups were followed longitudinally through their 20s to age 30. Additional details of PALS recruitment and interview schedule are available elsewhere (Molina et al., 2016).

2.1.2 | The current study—We used data from two follow-up assessments—the targeted age 25 and age 30 assessments. Data were provided by the participants and their parents (>90% mothers) from the ADHD and comparison groups. Participants were included in the current study if their parents completed the GLF at one or both of the visits. The GLF was added to PALS assessment battery in 2005, 6 years after the follow-up study began. Those with GLF data included 334 participants (ADHD = 186; comparison = 148) for the age 25 sample (M_{age} = 24.80 years, SD_{age} = 0.46, range = 24–26) and 401 participants (ADHD = 237; comparison = 164) for the age 30 sample (M_{age} = 29.30 years, SD_{age} = 0.64, range = 28–33). Most demographic characteristics of participants in the ADHD and comparison groups were comparable, with the exception of two variables. At both assessments, the educational attainment of the ADHD group was lower than the comparison group. At the age 30 assessment, the ADHD group was slightly older than the comparison group, d = 0.25, p = 0.01. At both assessments, most participants (86%) spoke to or saw their mothers at least once per week; participants in the ADHD group interacted with their mothers more frequently than the comparison group (see Table 1).

2.2 | Measures

2.2.1 | Functioning in adulthood

General Life Functioning Scale—Parent version: Informed by literature review and clinical team consensus, the GLF was developed to measure participants' global functioning in adulthood via self- and parent reports. The GLF-P is the focus of the current investigation. Parents were asked, "Compared to other people of the same age, where do you think your son or daughter is at this stage of his or her life, with regard to" 18 items (e.g., finances or supporting oneself financially). Parents were asked to select one of six responses: *a good deal further ahead, somewhat further ahead, about where he/she should be, somewhat behind, a good bit behind*, and *I don't know*. For the current study, we coded "I don't know" responses as missing. Thus, item scores have a range of 1–5, with higher scores indicating poorer functioning.

Impairment Rating Scale: Parents indicated the degree of their son's/daughter's impairment in twelve domains by marking an X on a continuum from "*no problem, definitely does not need treatment or special services*" to "*extreme problem, definitely needs treatment or special services*." Responses were coded 0–6, with higher ratings indicating more severe impairment. Based on previous work using the IRS (Sibley et al., 2012), we

used the overall impairment item as an indication of global functioning when examining the convergent validity of the GLF-P.

Objective measures of functioning: Given the relative objectivity and importance of education achieved and financial independence in adulthood (Altszuler et al., 2016; Kuriyan et al., 2013), we used self-reported variables for these domains of functioning. One item (number of years of education completed) was drawn from the *Education History Questionnaire* (Kuriyan et al., 2013). We also used three items from the *Finance Questionnaire* (Altszuler et al., 2016). Participants reported their monthly earnings before taxes on a scale from 1 ($0) to 9 ($7000 or more) and provided a numeric value for the amount of money in their savings accounts. They reported the presence/absence of any debts (excluding home, car, and student loans). If they answered yes, they selected a response from 1 ("less than $100") to 5 ("more than $10,000").

2.3 | Analysis plan

We conducted all analyses in R version 3.5.3 (R Core Team, 2019). We estimated all regression models using Full Information Maximum Likelihood (Arbuckle, 2013). We examined item distributions using histograms and Shapiro tests and missing data patterns.

2.3.1 | Factor structure—

To examine relations among item scores, we computed means, standard deviations, and bivariate correlation coefficients among GLF-P items at ages 25 and 30.

Exploratory factor analyses (EFAs): We performed EFAs of the age 25 GLF-P items using iterated principal factor extraction. As we expected all latent variables to be correlated, we used the oblimin rotation. We calculated the Kaiser-Meyer-Olkin (KMO; Cerny & Kaiser, 1977) for each GLF-P item to examine sampling adequacy for factor analyses. We conducted Horn's parallel analysis (Horn, 1965), which compared the empirical eigenvalues to those from Monte-Carlo simulation of the same sample size to determine the number of factors to retain. Additionally, we assessed eigenvalues, scree plots, and explained variance. The a priori determined cutoff value of factor loadings was 0.45 (Comrey & Lee, 1992).

Confirmatory factor analyses (CFA): We conducted a series of CFAs of the age 30 GLF-P items to verify the factor structure derived from the EFAs of the age 25 data. That is, we used the age 25 data as a training set and the age 30 data as a test set to validate our models (Hastie et al., 2009). Results from histograms and Shapiro tests indicated nonnormality in item distributions. To account for nonnormality, we estimated all models using maximum likelihood estimation with robust *SE*s (MLR) and assessed the fit of our models using robust fit indices, such as the Satorra-Bentler scaled χ^2. Following the standard guidelines to assess goodness-of-fit (Brown, 2006; Browne & Cudeck, 1993; Hu & Bentler, 1999; Loehlin, 2004), we evaluated multiple global and comparative fit indices. Robust statistics were reported as applicable. Conservative criteria of adequate fit included: (1) the fit comparative index (CFI; Bentler, 1990) >0.95; (2) the Tucker–Lewis index (TLI; Tucker & Lewis, 1973) >0.95; (3) the root-mean-square error of approximation (RMSEA; Steiger & Lind, 1980) <0.05; and (4) the standardized root-mean-square residual (SRMR; Steiger & Lind,

1980) <0.05. As fit indices are often affected by sample sizes, model specification, and sample distributions (MacCallum et al.,1996), we also considered a liberal set of cutoff values: (1) CFI > 0.90, (2) TLI > 0.90, (3) RMSEA < 0.10, and (4) SRMR < 0.10. Lower Akaike information criterion (AIC; Akaike, 1974) and Bayesian information criterion (BIC; Schwarz, 1978) indicated a better fit. To select the best-fitting model, we also conducted χ^2 difference tests. Sequentially, we tested for configural, metric, scalar, and strict factorial invariance across diagnostic groups (ADHD vs. comparison) and age groups (age 25 vs. age 30) using the best-fitting model. Monte Carlo simulation studies have suggested that χ^2 is overly sensitive to small deviations in large samples (Chen, 2007; Cheung & Rensvold, 2002), so we followed recommendations from Chen (2007): a decrease in the CFI < .010 and an increase in the RMSEA < .015 indicated invariance.

In addition to assessing global fit, we also examined local fit. We assessed the matrix of standardized covariance residuals for each model (McDonald & Ho, 2002; Muthén, 2007) using lavaan. Standardized covariance residuals are computed by subtracting the covariance implied by the factor model from the observed sample covariance and dividing by the *SE* of this difference, putting the results on a *z*-score metric. In the context of CFA models such as those presented here, large and positive covariance residuals (e.g., those that approach or exceed the *z*-score cutoff of 1.96) between item loadings on the same factor indicate instances in which the sample covariation between the items far exceeds the amount of covariation predicted by the model (i.e., the model under-predicts the covariation in the data).

One explanation for item pairs that exhibit covariation above and beyond that predicted by the common factor is that these items may have correlated unique factors—that is, the unique parts of these items left over after their prediction by the common factor (the measurement residuals) may correlate (Hayes & Usami, 2020). This explanation is particularly plausible when the content of the items comprising the pair shares common features beyond their relationship to the overarching construct (see Bandalos, 2021). For example, participants' responses to items asking about "Finances or supporting yourself financially" (item a) and "Employment" (item b) may correlate with one another both because these items assess "achievement and aspirations" (Factor 1) and because they do so in the context of related domains (gainful employment and financial solvency). As such, participants may respond more similarly to these items than to other, less intimately related indicators of achievement such as education or having meaningful personal goals, leading these items to exhibit specific factor covariation above and beyond their prediction by the common factor.

Thus, the decision to retain particular item pairs in CFA models was based on a combination of statistical (covariance residuals approach or exceed the *z*-score cutoff of 1.96) and substantive (theoretically similar items) criteria. For all item pairs identified as plausible candidates for unique factor correlations, we examined the item wordings to assess whether it seemed plausible that specific aspects of the items would correlate, above and beyond their relationship to the common factor. By scrutinizing the item-meanings to either corroborate or, in some instances, cast doubt upon the plausibility of possible model modifications suggested by statistical indices of local misfit, we hoped to reduce the likelihood of

capitalizing on chance sampling fluctuations and arrive at a theoretically defensible final model.

2.3.2 | Internal consistency—We calculated alpha (Cronbach, 1951) and omega (McDonald, 1999) separately for each subscale. Alpha is the most widely used index of internal consistency; however, it is subject to sample size and item numbers, and more importantly, assumes tau-equivalency (all factor loadings are equal for all items). Omega does not assume tau equivalency.

2.3.3 | Convergent validity—We computed correlation coefficients to examine the relation between GLF-P subscale means and the parent-reported IRS overall item, as well as the relations between subscale means and participants' self-reported education, earnings, debts, and savings.

2.3.4 | Known-group validity—We compared subscale means between ADHD and comparison groups using *t*-tests to examine known-group validity. Known-group validity indirectly assesses the validity of a scale by demonstrating differences between groups (Netemeyer et al., 2003).

3 | RESULTS

Bivariate correlation coefficients among the GLF-P items at ages 25 and 30 were all positive and mostly moderate to large in magnitude. A relatively large range of coefficients among the items (Table S2) suggested that the items have shared and unique variances, necessitating identifying the best-fitting factor solution.

3.1 | Factor structure

3.1.1 | Exploratory factor analyses—Item KMOs ranged from 0.90 to 0.97, indicating factor adequacy for EFA. Eigenvalues (>1.25) and scree plots suggested a one-factor solution, but it had poor global fit (χ^2 = 1522.26, df = 135, p < 0.01, TLI = 0.78, RMSEA = 0.15, BIC = 694.84). Our parallel analysis suggested extracting five factors. Although an extracted five-factor solution accounted for less variance in the GLF-P items than the one-factor solution (48.8% vs. 58.1%, respectively), goodness of fit for the five-factor solution was better (χ^2 = 320.60, df = 73, p < 0.01, TLI = 0.92, RMSEA = 0.09, BIC = 126.81). Three items (i.e., h. Constructive or healthy use of free time, i. Mental health, m. Community or societal responsibilities) were removed due to low loadings (<0.45) for all five extracted factors: Factor 1, Achievement and aspirations; Factor 2. Humor, happiness, and satisfaction; Factor 3, General responsibility, moral development, drug/alcohol use; Factor 4, Getting along with others; Factor 5, Relationship commitment and responsibility. Factor loadings and percentages of explained variance are presented in Table 2.

3.1.2 | Confirmatory factor analyses—We fit the age 30 data for the 15 items from the age 25 EFA to the five-factor model. Four item covariances (for unique factor covariances, see Table 3) were included reflecting relatively greater within-pair content similarity than for other pairs of items (Hayes & Usami, 2020). Considering that the five factors were highly correlated, we evaluated two alternative CFA models, including

a first-order one-factor model (i.e., all 15 items loaded on a unidimensional latent construct) and a second-order five-factor model (i.e., all five factors loaded on a general higher-order construct). Parameter estimates are reported in Table 3. Fit indices are reported in Table 4. Global fit indices in the single-order five-factor model showed adequate fit (χ^2 = 177.89, *df* = 76, $p < 0.01$, CFI = 0.974, TLI = 0.964). Although differences were small, the single-order five-factor model (AIC = 13,605, BIC = 13,841) showed statistically significantly better fit to the data than the single-order one-factor model (AIC = 13,776, BIC = 13,972, $p < 0.01$) and the second-order model (AIC = 13,614, BIC = 13,830, $p = 0.01$). The SRMR values of all models displayed adequate fit (<0.05). The RMSEA values of all models did not meet the conservative cutoff for good fit (<0.05) but did meet our liberal cutoff (<0.10). We retained the five-factor model to test for measurement invariance because of the slightly better fit relative to the other models, because it retained distinctions between domains of functioning, and because it was most similar to the best factor solution identified at age 25.

3.1.3 | Measurement invariance—Results indicated measurement invariance across diagnostic and age groups (Table 5). Model fit was not significantly lowered when parameters were incrementally constrained across groups (CFI < .01) (Chen, 2007; Little, 2013, Chapter 5). At the age 25 assessment, we found configural, metric, scalar, and strict factorial invariance across the ADHD and comparison groups (constraining loadings and intercepts). At the age 30 assessment, we found configural, metric, and scalar factorial invariance across the ADHD and comparison groups (constraining loadings and intercepts); strict factorial invariance (i.e., constraining loadings, intercepts, and residual variances) was not established. However, strict factorial invariance is considered overly restrictive and thus is not required to establish measurement invariance (Little, 2013, Chapter 5). We also found evidence for configural, metric, and scalar factorial invariances across age groups, as the change in model fit was negligible when parameters (i.e., loading, intercepts, and variances) were incrementally constrained across the age 25 and age 30 data. The model also reached strict factorial invariance across age groups, although, once again, methodologists do not recommend this model.

3.2 | Internal consistency

In the age 30 data, internal consistency was also high in each of the subscales: Factor 1 (α = 0.86, ω = 0.91), Factor 2 (α = 0.88, ω = 0.92), Factor 3 (α = 0.82, ω = 0.83), Factor 4 (α = 0.86, ω = 0.86), and Factor 5 (α = 0.80, ω = 0.81). Considering the correlated measurement errors and unequal factor loadings in the CFA model, we advise referring to the omega coefficients.

3.3 | Convergent validity

As displayed in Table 6, GLF-P subscale mean scores were positively correlated with the overall impairment item on the IRS, *r*s = 0.55–0.65, *p*s < 0.05. GLF-P subscale mean scores were negatively correlated with participants' self-reported education in years, monthly earnings, and total savings, *r*s= −0.12–−0.45, *p*s < 0.05, with the strongest associations demonstrated for the items assessing "achievement and aspirations." None of the subscale means were significantly correlated with participants' self-reported debts. For comparison, the overall impairment item on the IRS was also negatively correlated with participants'

self-reported education in years, monthly earnings, and total savings, at slightly lower levels, *r*s= −0.12–−0.39, *p*s < 0.05.

3.4 | Known-groups validity

Ratings of impairments for the individuals with ADHD histories were significantly higher than ratings for their peers without ADHD histories, in the age 30 data, across all domains, *p*s < 0.05: Factor 1 (ADHD: *M* = 3.62, *SD* = 1.15; comparison: *M* = 2.49, *SD* = 1.01, *d* = 1.04), Factor 2 (ADHD: *M* = 3.32, *SD* = 1.12; comparison: *M* = 2.36, *SD* = 0.98, *d* = 0.90), Factor 3 (ADHD: *M* = 3.14, *SD* = 1.13; comparison: *M* = 2.39, *SD* = 0.91, *d* = 0.77), Factor 4 (ADHD: *M* = 3.34, *SD* = 1.07; comparison: *M* = 2.55, *SD* = 0.97, *d* = 0.77), and Factor 5 (ADHD: *M* = 3.73, *SD* = 1.22; comparison: *M* = 2.63, *SD* = 1.02, *d* = 0.97).

4 | DISCUSSION

Recognition of the importance of measuring and clinically targeting impairment among adults with ADHD has increased in the research literature. In the current study, we evaluated the GLF-P to determine its utility for measuring functioning in adults with ADHD histories. Our identified five-factor solution (Factor 1: Achievement and aspirations; Factor 2: Humor, happiness, and satisfaction; Factor 3: General responsibility, moral development, drug/alcohol use; Factor 4: Getting along with others; Factor 5: Relationship commitment and responsibility) mapped onto the core functional deficits associated with ADHD, such as poor financial, occupational, educational, peer and marital outcomes, as well as the overall quality of life (Erskine et al., 2016; Gordon & Fabiano, 2019; Pelham et al., 2020; also see reviews in Barkley, 2015). It is worth noting that assessment of the quality of life may become increasingly relevant as youth transition into adulthood. Our five identified domains generally aligned with themes identified from adults' subjective reflections about ADHD above and beyond treatment in a recent qualitative study (Adamou & Jones, 2020); these included (1) loss of opportunity to fulfill educational and occupational roles, (2) labeling and attitudes from others, (3) psychological responses to ADHD, (4) barriers placed on interpersonal relationships, and (5) lack of a supportive network. Our results also revealed that the GLF-P had satisfactory validity.

The findings herein contribute to the literature on the measurement of functioning in adults with ADHD. In contrast to the one-factor solution for the BFIS (Barkley, 2011), our EFA using age 25 data and CFA using age 30 data indicated that the first-order five-correlated factor model provided a better fit than the one-factor (and the second-order five-factor) models. Reasons for this distinction may include differences in prompts (e.g., "difficulties in functioning" in the past 6 months in the BFIS vs. "levels of functioning" compared to peers in the GLF-P) and informants (self-report for the BFIS vs. parent-report for the GLF-P). Notably, the single factor extracted from the BFIS items is labeled the Adaptive-Social Impairment factor (Barkley, 2011); the GLF-P assesses domains beyond social and adaptive impairment and includes items pertaining to adults' quality of life, such as happiness and general life satisfaction. Tests of factorial invariance of the best-fitting model suggested generalizability (within constraints of our sample) of GLF-P items and factors, as measurement invariance was achieved across diagnostic groups (ADHD vs. comparison)

and time points (age 25 vs. age 30). Therefore, the GLF-P appears to reasonably measure these five distinct domains of functioning. We do note, however, that the one-factor model demonstrated an acceptable (despite slightly worse than the five-factor solution) fit at age 30 suggesting the possibility of one general factor, similar to what is reported for the BFIS.

The GLF-P demonstrated strong internal consistency, known-group validity, and convergent validity. The omega and alpha coefficients of the GLF-P factors were above .8, which supported the unidimensionality of each subscale. Internal consistency of the measure was also comparable to what is reported for the BFIS (Barkley, 2011). With respect to known-group validity, the GLF subscales appropriately differentiated the ADHD and comparison groups as expected, consistent with the literature on the long-term impairment associated with childhood ADHD (e.g., Klein et al., 2012). Note that our ADHD group definition (childhood-diagnosed ADHD) included a range of symptoms and functioning levels in adulthood (Sibley et al., 2012); between-group differences may be larger when all participants are presenting for current diagnosis and treatment. Our findings also provided evidence of convergent validity. We found significant relations between the GLF-P subscale means and selected objective measures that reflect primary indicators of adult functioning, including educational attainment, earnings, and savings. These significant relations, which were appropriately higher for Factor 1 (achievement and aspiration), suggested convergent validity of the measure. The GLF-P subscale means were not correlated with participants' debts (excluding student, car, and home loans); this may be related to the distribution of participants' debts, as most participants in our sample reported minimal debts (less than $100). Notably, many participants in the ADHD group received financial support that is often not considered as debts, such as assistance from their relatives and social welfare programs (Altszuler et al., 2016). GLF-P subscale means were also consistently correlated with the parent-reported overall item on the IRS, indicating their significant but incomplete overlap. Additionally, the correlation coefficients between the overall impairment item on the IRS and functioning variables (i.e., education in years, monthly earnings, and total savings) were slightly lower than those between some subscale means and functioning variables, suggesting the possible added value of GLF-P in clinical assessment.

These findings suggest some benefits in using the GLF-P, but we also note some limitations of our study. First, factor structures and loadings should be further validated in different samples. For example, individuals with childhood ADHD (in the current sample) may be more impaired in certain domains than those who are not diagnosed until adulthood (Sibley et al., 2018), indicating, possibly, different factor solutions for individuals who received ADHD diagnoses in adulthood. Furthermore, factor structures may change as parental involvement, societal expectations and family obligations change, necessitating a re-evaluation of psychometric properties and clinical utility of the GLF-P as participants age into their late 30s and early 40s. For instance, most young adults in the ADHD group kept relatively frequent contact with their mothers at age 30 whereas young adults in the comparison group showed a significant decrease in the frequency of interactions with parents over time, suggesting that the clinical utility of collecting parent reports may be relatively more (or uniquely) important to understand the functioning of adults with ADHD, but perhaps less so for adults without ADHD. Second, we did not test for measurement invariance across participants' gender, racial and/or ethnic groups or rater types (i.e., fathers

vs. mothers). Participants in the current study are predominantly White, non-Hispanic males (see Table 1), with GLF-P ratings completed by their mothers. Notably, although our study focused on ADHD and non-ADHD comparison groups, the GLF is designed for assessing general, rather than disorder-specific, functioning, and therefore may be useful in other clinical samples. Given that changes in the frequency of parental contact vary by clinical profile (ADHD vs. comparison in the current study), missing data patterns and measurement invariance across various clinical profiles (beyond ADHD) should be examined. Samples with diverse demographic and clinical characteristics will provide opportunities to further test for measurement invariance. Also, the GLF should be further tested within different cultural contexts. Relatedly, Weiss et al. (2018) reported cultural differences in validation studies of the WFIRS. Translating, adapting, and validating the self-and other- reports of the GLF may help disseminate this tool to non-English-speaking cultures.

Future research on the GLF should examine psychometrics of self-report, probe sources of informant discrepancy (e.g., self vs. others, parents vs. romantic partners), and advance theoretical frameworks of multi-informant assessments, such as the Operations Triad Model (De Los Reyes et al., 2013). Other informant report is considered essential to obtain an accurate profile of the impairments of young adults (Sibley et al., 2012, 2021); therefore, we focused this first study of the psychometrics of the GLF on informant- rather than on self-report. We will extend the study of the psychometrics of the GLF to self-report, and concordance between self-and informant reports, in future research. Although parents often play vital roles in young adults' lives (especially adults with ADHD), using parent reports as a sole source may miss important information (Table S2). For example, 19% of parents in our age 25 sample and 13% of parents in our age 30 sample indicated that they did not know about their son's or daughter's responsibilities regarding marriage or children. Thus, compared to parents, romantic partners and friends may provide more valuable information about adults' relationships and commitment. Research on the relative utility of other informant reports, such as romantic partners, for adults with versus without ADHD, may be helpful. Frequency of contact might be used as a criterion for identifying the best informant and/or an important auxiliary variable for imputing missing data (when informants indicated "I don't know").

Additional work is also needed to increase the clinical utility of the measure. The GLF-P was developed for parents to compare their son's or daughter's functioning with their peers (e.g., 1 = a good deal further ahead; 2 = somewhat further ahead) to index functioning deficits relative to perceived developmentally referenced descriptive norms. Although such explicit prompts avoid potentially stigmatizing words, such as "difficulty" and "problems" and encourage parents to think about expected norms instead of their family members (e.g., parents themselves or siblings), parents' assumptions about age-based norms can depend on their social networks and psychological literacy, possibly contributing to their own reporting bias and discrepancy with other reports (e.g., romantic partner). Future analyses such as receiver operating characteristic curve and Item Response Theory may be helpful in determining optimal cutoffs, by informant, for clinical impairment (Kroc & Olvera Astivia, 2021).

5 | CONCLUSION

Despite its limitations and the need for further investigation, the GLF-P has potential applications for clinical research and practice. Acquiring information about general functioning from parents of individuals with ADHD efficiently is essential to research, as other informant reports have proven to be important information sources for this population (e.g., Altszuler et al., 2016). If the GLF-P proves to have robust factor structures across samples and settings, relate to other objective measures, and predict important outcomes above and beyond existing measures of impairment, it may be especially helpful clinically and can be added to assessment batteries. For example, the GLF may improve a clinician's efficiency in understanding a patient's key challenges and identifying intervention modalities needed to improve functional life skills. Given that the GLF assesses real-life attainment of adult roles and responsibilities relative to age-based expectations, the measure may be especially helpful in the absence of participant-identified need for treatment. Ultimately, the GLF (which assesses general functioning levels compared to perceived peer functioning levels), along with measures such as the IRS (which assesses needs for treatment), may provide valuable complementary information, which may justify utilizing both to inform treatment. Additional research will aid the determination of the appropriateness, utility, areas for improvement, and feasibility of the GLF for research and clinical applications.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request and appropriate institutional oversight and approval.

REFERENCES

Adamou M, & Jones SL (2020). Quality of life in adult ADHD: A grounded theory approach. Psychology, 11(11), 1794–1812. 10.4236/psych.2020.1111113

Akaike H (1974). A new look at the statistical model identification. IEEE transactions on automatic control, 19(6), 716–723.

Altszuler AR, Page TF, Gnagy EM, Coxe S, Arrieta A, Molina BS, & Pelham WE Jr. (2016). Financial dependence of young adults with childhood ADHD. Journal of Abnormal Child Psychology, 44(6), 1217–1229. [PubMed: 26542688]

Arbuckle JN (2013). Full information estimation in the presence of incomplete data. In (Eds.) Marcoulides GA & Schumacker RE, Advanced structural equation modeling: Issues and techniques (pp. 243–277). Psychology Press.

Bandalos DL (2021). Item meaning and order as causes of correlated residuals in confirmatory factor analysis. Structural Equation Modeling: A Multidisciplinary Journal, 28, 1–11. 10.1080/10705511.2021.1916395

Barkley RA (2011). Barkley functional impairment scale (BFIS for adults) Guilford Press.

Barkley RA (2015). Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment (4th ed.). Guilford Press.

Bentler PM (1990). Comparative fit indexes in structural models. Psychological Bulletin, 107(2), 238–246. 10.1037/0033-2909.107.2.238 [PubMed: 2320703]

Brown T (2006). CFA with equality constraints, multiple groups, and mean structures. Confirmatory factor analysis for applied research (pp. 236–319). Guilford.

Browne MW, & Cudeck R (1993). Alternative ways of assessing model fit. Sociological Methods & Research, 21(2), 230–258. 10.1177/0049124192021002005

Canu WH, Hartung CM, Stevens AE, & Lefler EK (2020). Psychometric properties of the Weiss Functional Impairment Rating Scale: Evidence for utility in research, assessment, and treatment of ADHD in emerging adults. Journal of Attention Disorders, 24(12), 1648–1660. 10.1177/1087054716661421 [PubMed: 27481918]

Cerny CA, & Kaiser HF (1977). A study of a measure of sampling adequacy for factor-analytic correlation matrices. Multivariate Behavioral Research, 12(1), 43–47. 10.1207/s15327906mbr1201_3 [PubMed: 26804143]

Charach A, Yeung E, Climans T, & Lillie E (2011). Childhood attention-deficit/hyperactivity disorder and future substance use disorders: Comparative meta-analyses. Journal of the American Academy of Child & Adolescent Psychiatry, 50(1), 9–21. 10.1016/j.jaac.2010.09.019 [PubMed: 21156266]

Chen F (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. Structural Equation Modeling: A Multidisciplinary Journal, 14(3), 464–504. 10.1080/10705510701301834

Cheung GW, & Rensvold RB (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. Structural Equation Modeling, 9(2), 233–255. 10.1207/S15328007SEM0902_5

Comrey AL, & Lee HB (1992). A first course in factor analysis (2nd ed.). Lawrence Erlbaum Associates.

Cronbach LJ (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16, 297–334. 10.1007/BF02310555

Dawson AE, Egan TE, & Wymbs BT (2020). Psychometric properties of the impairment Rating Scale in samples of adults with attention deficit hyperactivity disorder. Assessment, 27(2), 384–403. [PubMed: 29239207]

De Los Reyes A, Thomas SA, Goodman KL, & Kundey SM (2013). Principles underlying the use of multiple informants' reports. Annual review of clinical psychology, 9, 123–149. 10.1146/annurev-clinpsy-050212-185617

Doshi JA, Hodgkins P, Kahle J, Sikirica V, Cangelosi MJ, Setyawan J, Erder MH, & Neumann PJ (2012). Economic impact of childhood and adult attention-deficit/hyperactivity disorder in the United States. Journal of the American Academy of Child & Adolescent Psychiatry, 51(10), 990–1002. [PubMed: 23021476]

Edelbrock C, Crnic K, & Bohnert A (1999). Interviewing as communication: An alternative way of administering the diagnostic interview schedule for children. Journal of Abnormal Child Psychology, 27(6), 447–453. 10.1023/A:1021979925865 [PubMed: 10821626]

Erskine HE, Norman RE, Ferrari AJ, Chan GC, Copeland WE, Whiteford HA, & Scott JG (2016). Long-term outcomes of attention-deficit/hyperactivity disorder and conduct disorder: a systematic

review and meta-analysis. Journal of the American Academy of Child & Adolescent Psychiatry, 55(10), 841–850. [PubMed: 27663939]

Fabiano GA, Pelham WE Jr., Waschbusch DA, Gnagy EM, Lahey BB, Chronis AM, Onyango AN, Kipp H, Lopez-Williams A, & Burrows-MacLean L (2006). A practical measure of impairment: Psychometric properties of the impairment rating scale in samples of children with attention deficit hyperactivity disorder and two school-based samples. Journal of Clinical Child and Adolescent Psychology, 35(3), 369–385. [PubMed: 16836475]

Flory K, Molina BS, Pelham WE Jr., Gnagy E, & Smith B (2006). Childhood ADHD predicts risky sexual behavior in young adulthood. Journal of Clinical Child and Adolescent Psychology, 35(4), 571–577. 10.1207/s15374424jccp3504_8 [PubMed: 17007602]

Gordon CT, & Fabiano GA (2019). The transition of youth with ADHD into the workforce: Review and future directions. Clinical Child and Family Psychology Review, 22, 1–32. 10.1007/s10567-019-00274-4 [PubMed: 30783911]

Harstad EB, Katusic S, Sideridis G, Weaver AL, Voigt RG, & Barbaresi WJ (2022). Children with ADHD are at risk for a broad array of adverse adult outcomes that cross functional domains: Results from a population-based birth cohort study. Journal of attention disorders, 26(1), 3–14. 10.1177/1087054720964578 [PubMed: 33090057]

Hastie T, Tibshirani R, & Friedman JH (2009). The elements of statistical learning: Data mining, inference, and prediction (2nd ed.). Springer-Verlag. https://web.stanford.edu/%7Ehastie/ElemStatLearn/printings/ESLII_print12.pdf

Hayes T, & Usami S (2020). Factor score regression in the presence of correlated unique Factors. Educational and Psychological Measurement, 80(1), 5–40. [PubMed: 31933491]

Hinshaw SP, & Stier A (2008). Stigma as related to mental disorders. Annual review of clinical psychology, 4, 367–393.

Horn JL (1965). A rationale and test for the number of factors in factor analysis. Psychometrika, 30(2), 179–185. 10.1007/BF02289447 [PubMed: 14306381]

Hoza B, Gerdes AC, Hinshaw SP, Arnold LE, Pelham WE Jr., Molina BS, Abikoff H, Epstein JN, Greenhill L, Hetchman L, Odbert C, Swanson J, & Odbert C (2004). Self-perceptions of competence in children with ADHD and comparison children. Journal of Consulting and Clinical Psychology, 72(3), 382–391. 10.1037/0022-006X.72.3.382 [PubMed: 15279522]

Hu LT, & Bentler PM (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1–55. 10.1080/10705519909540118

Klein RG, Mannuzza S, Olazagasti MAR, Roizen E, Hutchison JA, Lashua EC, & Castellanos FX (2012). Clinical and functional outcome of childhood attention-deficit/hyperactivity disorder 33 years later. Archives of General Psychiatry, 69(12), 1295–1303. 10.1001/archgenpsychiatry.2012.271 [PubMed: 23070149]

Kroc E, Olvera Astivia O (2021). The importance of thinking multivariately when setting subscale cutoff scores. Educational and Psychological Measurement, 1–22. 10.1177/00131644211023569

Kuriyan AB, Pelham WE Jr., Molina BS, Waschbusch DA, Gnagy EM, Sibley MH, Babinski DE, Walther C, Cheong J, Yu J,& Kent KM (2013). Young adult educational and vocational outcomes of children diagnosed with ADHD. Journal of Abnormal Child Psychology, 41(1), 27–41. 10.1007/s10802-012-9658-z [PubMed: 22752720]

Little TD (2013). Longitudinal structural equation modeling Guilford press.

Loehlin JC (2004). Latent variable models: An introduction to factor, path, and structural equation analysis Psychology Press

MacCallum RC, Browne MW, & Sugawara HM (1996). Power analysis and determination of sample size for covariance structure modeling. Psychological Methods, 1(2), 130–149. 10.1037/1082-989X.1.2.130

McDonald RP (1999). Test theory: A unified treatment Lawrence Erlbaum.

McDonald RP, & Ho M-HR (2002). Principles and practice in reporting structural equation analyses. Psychological Methods, 7(1), 64–82. 10.1037/1082-989X.7.1.64 [PubMed: 11928891]

Mohr-Jensen C, & Steinhausen HC (2016). A meta-analysis and systematic review of the risks associated with childhood attention-deficit hyperactivity disorder on long-term outcome

of arrests, convictions, and incarcerations. Clinical Psychology Review, 48, 32–42. 10.1016/j.cpr.2016.05.002 [PubMed: 27390061]

Molina BS, Howard AL, Swanson JM, Stehli A, Mitchell JT, Kennedy TM, Epstein JN, Arnold EL, Hechtman L, Vitiello B, & Hoza B (2018). Substance use through adolescence into early adulthood after childhood-diagnosed ADHD: Findings from the MTA longitudinal study. Journal of Child Psychology and Psychiatry, 59(6), 692–702. 10.1111/jcpp.12855 [PubMed: 29315559]

Molina B, Sibley MH, Pedersen SL, & Pelham WE Jr. (2016). The Pittsburgh ADHD Longitudinal Study (PALS). In Hechtman L, Attention Deficit *Hyperactivity Disorder: Adult Outcome and Its Predictors* (pp. 105–155). Oxford, England: Oxford University Press.

Muthén B (2007). Standardized Residuals in Mplus 1 Overview http://www.statmodel.com/download/StandardizedResiduals.pdf

Netemeyer RG, Bearden WO, & Sharma S (2003). Scaling procedures: Issues and applications Sage Publications

Pelham WE Jr., Gnagy EM, Greenslade KE, & Milich R (1992). Teacher ratings of DSM-III-R symptoms for the disruptive behavior disorders. Journal of the American Academy of Child & Adolescent Psychiatry, 31(2), 210–218. [PubMed: 1564021]

Pelham WE III, Page TF, Altszuler AR, Gnagy EM, & Pelham WE Jr. (2020). The long-term financial outcome of children diagnosed with ADHD: A prospective, longitudinal, case-control study. Journal of Consulting and Clinical Psychology, 88(2), 160–171. 10.1037/ccp0000461 [PubMed: 31789549]

R Core Team. (2019). R: A language and environment for statistical computing (version 3.5.3) R Foundation for Statistical Computing. http://www.R-project.org/

Schwarz G (1978). Estimating the dimension of a model. The Annals of Statistics, 6(2), 461–464. 10.1214/aos/1176344136

Sibley MH, Arnold LE, Swanson JM, Hechtman LT, Kennedy TM, Owens E, Jensen PS, Hinshaw SP, Roy A, Chronis-Tuscano A, Newcorn JH, Rohde LA, & MTA Cooperative G, MTA Cooperative Group. (2021). Variable patterns of remission from ADHD in the multimodal treatment study of ADHD. American Journal of Psychiatry Advance online publication. 1–9. 10.1176/appi.ajp.2021.21010032

Sibley MH, Pelham WE Jr., Molina BS, Gnagy EM, Waxmonsky JG, Waschbusch DA, Derefinko KJ, Garefino AC, Molina BSG, Wymbs BT, Babinski BE, & Kuriyan AB (2012). When diagnosing ADHD in young adults emphasize informant reports, DSM items, and impairment. Journal of Consulting and Clinical Psychology, 80(6), 1052–1061. 10.1037/a0029098 [PubMed: 22774792]

Sibley MH, Rohde LA, Swanson JM, Hechtman LT, Molina BS, Mitchell JT, Arnold EL, Caye A, Kennedy TM, Roy A, & Stehli A (2018). Late-onset ADHD reconsidered with comprehensive repeated assessments between ages 10 and 25. American Journal of Psychiatry, 175(2), 140–149.

Steiger JH, & Lind JC (1980, June). Statistically based tests for the number of common factors [paper presentation]. Psychometric Society 45th annual meeting, Iowa City, IA.

Tu JW, Owens EB, & Hinshaw SP (2019). Positive illusory bias still illusory? Investigating discrepant self-perceptions in girls with ADHD. Journal of Pediatric Psychology, 44(5), 576–588. 10.1093/jpepsy/jsy109 [PubMed: 30649391]

Tucker LR, & Lewis C (1973). A reliability coefficient for maximum likelihood factor analysis. Psychometrika, 38(1), 1–10. 10.1007/BF02291170

Weiss M (2000). Weiss Functional Impairment Rating Scale Self-Report (WFIRS-S) https://www.caddra.ca/wp-content/uploads/WFIRS-S.pdf

Weiss MD, McBride NM, Craig S, & Jensen P (2018). Conceptual review of measuring functional impairment: Findings from the Weiss functional impairment rating scale. Evidence-Based Mental Health, 21(4), 155–164. [PubMed: 30314990]

TABLE 1

Demographic and family information for the age 25 and age 30 samples

	Age 25						Age 30					
	ADHD (*n* = 186)		Comparison (*n* = 148)				ADHD (*n* = 237)		Comparison (*n* = 164)			
	M* or *n	***SD* or %**	***M* or *n***	***SD* or %**	***t*(*df*)[a] or χ^2(*df*)**	***p***	***M* or *n***	***SD* or %**	***M* or *n***	***SD* or %**	***t*(*df*)[a] or χ^2(*df*)**	***p***
Age	24.81	0.48	24.79	0.44	0.42 (325)	0.67	29.36	0.73	29.2	0.47	2.70 (397)	0.01
Sex (Male)	170	91%	133	92%	0.08 (1)	0.77	206	87%	141	86%	0.02 (1)	0.9
Race and ethnicity					1.86 (5)	0.87					7.58 (5)	0.18
African American	28	15%	17	11%			38	16%	16	10%		
Asian American	1	1%	1	1%			1	0%	0	0%		
Hispanic/Latinx	2	1%	1	1%			3	1%	0	0%		
Mixed race	11	6%	6	4%			13	5%	6	4%		
White, non-Hispanic	143	77%	122	82%			180	76%	141	86%		
Others	1	1%	1	1%			2	1%	1	1%		
Education[b]	14.43	2.33	16.65	1.99	9.29 (326)	<0.01	15.12	2.53	17.77	1.6	12.74 (392)	<0.01
Contact with mother[c]					22.09 (6)	<0.01					40.294 (8)	<0.01
5–7 days/week	99	53%	53	36%			106	45%	31	19%		
2–4 days/week	45	24%	53	36%			70	30%	62	38%		
Once a week	17	9%	25	17%			25	11%	41	25%		
2–3 days/month	9	5%	12	8%			13	5%	14	9%		
Once a month	6	3%	0	0%			1	0%	2	1%		
Every 2–3 months	4	2%	2	1%			8	3%	1	1%		
Once a year	0	0%	0	0%			1	0%	0	0%		
Less than once a year	0	0%	0	0%			1	0%	0	0%		
Never	3	2%	0	0%			1	0%	1	1%		

Abbreviations: *df* = degree of freedom; M, mean; *SD*, standard deviation.

[a] Welch two-sample t-tests were used for t-tests.

[b] Education attained in years.

[c] Participants were asked how frequently they saw or spoke with their mothers.

TABLE 2

Factor loadings of 5-factor exploratory factor analyses per parent report at age 25

GLF-P items	Factor loadings
Factor 1: Achievement and aspirations (14.5% variance)	
a. Finances or supporting yourself financially	0.94
b. Employment	0.88
c. Education	0.58
o. Having meaningful personal goals and a sense of purpose in life	0.50
Factor 2: Humor, happiness, and satisfaction (11.5% variance)	
p. Having a sense of humor or taking things in stride	0.54
q. Happiness	0.99
r. General life satisfaction	0.68
Factor 3: General responsibility, moral development, drug/alcohol use (8.1% variance)	
j. Controlling or limiting use of alcohol or drugs	0.55
l. Family responsibilities with regard to parents and siblings	0.58
n. Character or moral development	0.51
Factor 4: Getting along with others (7.9% variance)	
d. Friendships	0.50
f. Relationships with family members	0.56
g. Getting along with coworkers	0.57
Factor 5: Relationship commitment and responsibility (6.8% variance)	
e. Romantic relationships	0.81
k. Family responsibilities with regard to marriage or children	0.57
Low loading items	
h. Constructive or healthy use of free time	<0.45
i. Mental health	<0.45
m. Community or societal responsibilities	<0.45

Note: The extraction method was principal axis factoring with oblimin rotation. We used full information maximum likelihood (FIML) to impute missing data. Fit for the five-factor solution was good, $\chi^2 = 320.6$, degree of freedom = 73, $p < 0.01$, Tucker and Lewis index (TLI) = 0.92, root-mean-square error of approximation index (RMSEA) = 0.09, Bayesian information criterion (BIC) = 126.81.

TABLE 3

Standardized parameter estimates for five-factor and one-factor confirmatory factor analyses (15 items)

	Five-factor model				One-factor model			
Parameters	***Est***	***SE***	***z***	***p***	***Est***	***SE***	***z***	***p***
Factor loadings								
a. Finance	0.81	0.02	37.1	<0.01	0.77	0.02	33.24	<0.01
b. Employment	0.77	0.03	29.0	<0.01	0.74	0.03	26.33	<0.01
c. Education	0.77	0.03	29.9	<0.01	0.72	0.03	25.25	<0.01
o. Purpose in life	0.90	0.02	56.5	<0.01	0.86	0.02	48.08	<0.01
p. Humor	0.90	0.02	46.1	<0.01	0.87	0.02	55.42	<0.01
q. Happiness	0.90	0.02	49.0	<0.01	0.87	0.02	57.84	<0.01
r. Satisfaction	0.80	0.03	30.6	<0.01	0.78	0.02	31.92	<0.01
j. Alcohol/drugs	0.63	0.04	15.6	<0.01	0.60	0.04	14.50	<0.01
l. Responsibility (sibling/parents)	0.88	0.02	51.0	<0.01	0.85	0.02	43.87	<0.01
n. Moral development	0.82	0.02	37.6	<0.01	0.79	0.02	32.03	<0.01
d. Friendships	0.79	0.03	27.5	<0.01	0.75	0.03	26.73	<0.01
f. Relationships w/family members	0.86	0.02	45.9	<0.01	0.80	0.02	35.34	<0.01
g. Relationships w/coworkers	0.80	0.03	25.1	<0.01	0.74	0.03	22.44	<0.01
k. Responsibility (marriage/children)	0.84	0.03	29.2	<0.01	0.73	0.03	25.09	<0.01
e. Romantic relationships	0.80	0.03	26.0	<0.01	0.70	0.03	22.10	<0.01
Factor variances and covariances								
Variance (F1)	1	0	–	–	1	0	–	–
Variance (F2)	1	0	–	–	–	–	–	–
Variance (F3)	1	0	–	–	–	–	–	–
Variance (F4)	1	0	–	–	–	–	–	–
Variance (F5)	1	0	–	–	–	–	–	–
Covariance (F1, F2)	0.92	0.02	38.94	<0.01	–	–	–	–
Covariance (F1, F3)	0.89	0.02	38.70	<0.01	–	–	–	–
Covariance (F1, F4)	0.83	0.02	33.22	<0.01	–	–	–	–
Covariance (F1, F5)	0.81	0.03	24.04	<0.01	–	–	–	–
Covariance (F2, F3)	0.91	0.03	36.29	<0.01	–	–	–	–
Covariance (F2, F4)	0.91	0.03	34.68	<0.01	–	–	–	–
Covariance (F2, F5)	0.83	0.03	23.90	<0.01	–	–	–	–
Covariance (F3, F4)	0.92	0.02	47.25	<0.01	–	–	–	–
Covariance (F3, F5)	0.82	0.04	21.24	<0.01	–	–	–	–
Covariance (F4, F5)	0.82	0.04	22.76	<0.01	–	–	–	–
Item variances and covariances								
Variance (Item a)	0.35	0.04	9.79	<0.01	0.40	0.04	11.28	<0.01
Variance (Item b)	0.40	0.04	9.75	<0.01	0.46	0.04	11.20	<0.01
Variance (Item c)	0.41	0.04	10.55	<0.01	0.48	0.04	11.55	<0.01
Variance (Item d)	0.37	0.05	8.21	<0.01	0.44	0.04	10.42	<0.01
Variance (Item e)	0.35	0.05	7.16	<0.01	0.51	0.04	11.51	<0.01

	Five-factor model				One-factor model			
Parameters	***Est***	***SE***	***z***	***p***	***Est***	***SE***	***z***	***p***
Variance (Item f)	0.26	0.03	8.00	<0.01	0.35	0.04	9.68	<0.01
Variance (Item g)	0.35	0.05	6.83	<0.01	0.45	0.05	9.33	<0.01
Variance (Item j)	0.60	0.05	11.71	<0.01	0.65	0.05	13.21	<0.01
Variance (Item k)	0.30	0.05	6.30	<0.01	0.47	0.04	11.04	<0.01
Variance (Item l)	0.22	0.03	7.22	<0.01	0.28	0.03	8.70	<0.01
Variance (Item n)	0.32	0.04	8.83	<0.01	0.37	0.04	9.56	<0.01
Variance (Item o)	0.18	0.03	6.37	<0.01	0.26	0.03	8.48	<0.01
Variance (Item p)	0.36	0.04	8.70	<0.01	0.39	0.04	10.30	<0.01
Variance (Item q)	0.19	0.04	5.42	<0.01	0.24	0.03	8.96	<0.01
Variance (Item r)	0.19	0.03	5.86	<0.01	0.24	0.03	9.13	<0.01
Covariance (a, b)	0.54	0.06	9.15	<0.01	0.60	0.05	11.86	<0.01
Covariance (d, e)	0.34	0.07	4.64	<0.01	0.28	0.06	4.54	<0.01
Covariance (f, l)	0.45	0.08	5.73	<0.01	0.42	0.07	6.23	<0.01
Covariance (q, r)	0.54	0.08	6.64	<0.01	0.64	0.05	12.42	<0.01

Note: Data for CFA models were collected at age 30. The scale of each factor was set by fixing its variance to 1. *Est* = estimate; *SE* = standardized error; F1 = achievement and aspirations; F2 =humor, happiness, and satisfaction; F3 = general responsibility, moral development, and drug/alcohol use; F4 = getting along with others; F5 = relationship commitment and responsibility.

TABLE 4

Fit statistics for first-order and second-order models (15 items)

	Single-order models		Second-order model
	One-factor	Five-factor	Five-factor[a]
χ^2	315.88	177.89	192.62
df	86	76	81
p	<0.01	<0.01	<0.01
CFI	0.939	0.974	0.971
TLI	0.926	0.964	0.963
RMSEA [95% CI]	0.095 [0.084, 0.106]	0.066 [0.054, 0.079]	0.067 [0.055, 0.079]
SRMR	0.041	0.028	0.030
AIC	13,776	13,605	13,614
BIC	13,972	13,841	13,830

Note: Data for CFA models were collected at age 30.

Abbreviation: AIC, akaike information criterion; BIC, Bayesian information criterion; CFI, comparative fit index; CI, confidence interval; *df*, degree of freedom; RMSEA, root-mean-square error of approximation; SRMR, standardized root-mean-square residual; TLI, Tucker and Lewis index.

[a]All five latent factors loaded on a general higher-order construct.

TABLE 5

Invariance measurement analyses across diagnostic and age groups

	χ^2	*df*	AIC	BIC	RMSEA	SRMR	TLI	CFI	ΔCFI	Contrast	$\Delta\chi^2$	Δ*df*	*p*
Diagnosis (ADHD versus comparison) at age 25													
1. Configural	385.30	152	10,607	11,057	0.086	0.06	0.911	0.936	–	–	–	–	–
2. Weak/Metric	395.33	162	10,597	11,009	0.084	0.06	0.908	0.929	0.007	2 versus 1	9.73	10	0.460
3. Strong/Scalar	426.50	172	10,608	10,982	0.085	0.06	0.914	0.929	0.000	3 versus 2	31.31	10	0.001
4. Strict	456.34	187	10,608	10,924	0.089	0.07	0.917	0.926	0.003	4 versus 3	24.14	15	0.063
Diagnosis (ADHD versus comparison) at age 30													
1. Configural	348.64	152	13,473	13,944	0.073	0.04	0.950	0.964	–	–	–	–	–
2. Weak/Metric	353.97	162	13,458	13,890	0.069	0.08	0.954	0.964	<0.001	2 versus 1	5.90	10	0.820
3. Strong/Scalar	384.40	172	13,469	13,860	0.072	0.05	0.951	0.960	0.004	3 versus 2	29.32	10	0.001
4. Strict	462.61	187	13,517	13,848	0.079	0.06	0.941	0.947	0.013	4 versus 3	56.96	15	<0.001
Age (age 25 versus age 30)[a]													
1. Configural	488.21	152	24,285	24,828	0.073	0.03	0.953	0.966	–	–	–	–	–
2. Weak/Metric	504.16	162	24,281	24,778	0.071	0.04	0.951	0.962	0.004	2 versus 1	16.06	10	0.100
3. Strong/Scalar	518.03	172	24,275	24,726	0.070	0.04	0.957	0.965	0.003	3 versus 2	13.83	10	0.180
4. Strict	534.06	187	24,261	24,643	0.067	0.04	0.961	0.965	<0.001	4 versus 3	15.00	15	0.640

Note: Measurement and structural invariance were analyzed using the first-order five-factor model.

Abbreviation: AIC, akaike information criterion; BIC, Bayesian information criterion; CFI, comparative fit index; CI, confidence interval; df, degree of freedom; RMSEA, root-mean-square error of approximation; SRMR, standardized root-mean-square residual; TLI, Tucker and Lewis index.

[a]The age 25 and age 30 data were used.

TABLE 6

Factor-level descriptive and convergent validity of general life functioning—parent version (age 30 assessment)

			Correlation coefficients				
	M	***SD***	**IRS overall**[a]	**Education in years**[b]	**Monthly earnings**[b]	**Total savings**[b]	**Total debts**[b]
Factor 1. Achievement and aspirations	3.16	1.23	0.62***	−0.49***	−0.45***	−0.23***	−0.03
Factor 2. Humor, happiness, and satisfaction	2.93	1.16	0.65***	−0.28***	−0.24***	−0.17**	−0.04
Factor 3. General responsibility, moral development, and drug/alcohol use	2.83	1.11	0.55***	−0.32***	−0.14**	−0.12*	−0.01
Factor 4. Getting along with others	3.02	1.10	0.59***	−0.32***	−0.25***	−0.16**	<0.01
Factor 5. Relationship commitment and responsibility	3.28	1.26	0.55***	−0.27***	−0.29***	−0.16**	−0.05

Note: All measures were collected when participants were around 30 years old. IRS Overall = the overall severity of your son or daughter's problem in functioning and overall need for treatment or special services.

*$p < 0.05$.

**$p < 0.01$.

***$p < 0.001$.

[a]Parent-report.

[b]Self-report.