

## RESEARCH ARTICLE

# Psychometric properties and informant agreement of the WHODAS 2.0 in youth with mental disorder

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## Abstract

**Objective:** This study examined psychometric properties, parent-youth agreement, and factors associated with agreement on the 12-item and 36-item versions of the World Health Organization Disability Assessment Schedule (WHODAS) 2.0. **Methods:** Data come from a clinical sample of 56 youth, aged 14-17 years, receiving mental health care at a pediatric hospital. Correlations between the WHODAS 2.0, KIDSCREEN-27, and demographic variables were used to assess validity. Internal consistency was measured using ordinal alpha. The Bland-Altman method and intraclass correlation coefficients (ICC) were used to assess parent-youth agreement. Logistic regression examined factors associated with disagreement > 0.5 standard deviation. **Results:** For both parent and youth, correlations were low to moderate in exploring convergent ( $\tau = -0.42$  to  $0.01$ ) and divergent validity ( $\tau/r = -0.12$  to  $0.32$ ). Internal consistency was adequate ( $\alpha > 0.7$ ). Parent WHODAS 2.0 scores were significantly lower than youth scores and Bland-Altman plots revealed poor parent-youth agreement (ICC =  $-0.04$  to  $0.33$ ). Lower household income was associated with lower odds of disagreement on the 35-item WHODAS 2.0 (OR =  $0.28$ , 95% CI =  $0.08-0.99$ ), and older youth age was associated with lower odds of disagreement on the 12-item WHODAS 2.0 (OR =  $0.40$ , 95% CI =  $0.19-0.84$ ). **Conclusion:** The psychometric properties of both WHODAS 2.0 versions were similar, so the abbreviated version may be sufficient to measure functional impairment in a clinical context. Additional research is needed to better understand the factors that influence discrepancies between informants and the implications for care. However, reports from both youth and parents appear valuable in understanding functional impairment.

**Key Words:** mental health, agreement, informant discrepancies, parents, youth, functional impairment

## Résumé

**Objectif:** La présente étude a examiné les propriétés psychométriques, l'entente parent-jeune, et les facteurs associés à l'entente sur les versions en 12 items et en 36 items de la World Health Organization Disability Assessment Schedule (WHODAS) 2.0 (calendrier d'évaluation du handicap de l'OMS). **Méthodes:** Les données proviennent d'un échantillon clinique de 56 jeunes, de 14 à 17 ans, qui reçoivent des soins de santé mentale dans un hôpital pédiatrique. Les corrélations entre le WHODAS 2.0, KIDSCREEN-27, et les variables démographiques ont servi à évaluer la validité. La cohérence interne était mesurée à l'aide d'alpha ordinal. La méthode Bland-Altman et les coefficients de corrélation interclasse (CIC) ont servi à évaluer l'entente parent-jeune. La régression logistique a examiné les facteurs associés à la mésentente de > 0,5 déviation standard. **Résultats:** Pour les parents et les jeunes, les corrélations étaient de faibles à modérées en explorant la validité convergente ( $\tau = -0,42$  à  $0,01$ ) et divergente ( $\tau/r = -0,12$  à  $0,32$ ). La cohérence interne

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était adéquate ( $\alpha > 0,7$ ). Les scores des parents au WHODAS 2.0 étaient significativement plus faibles que les scores des jeunes et les tracés Bland-Altman révélèrent une mauvaise entente parent-jeune (CIC = -0,04 à 0,33). Le revenu du ménage plus faible était associé avec des probabilités plus faibles de mésentente au WHODAS 2.0 de 35 items (RC = 0,28, IC à 95 % = 0,08 à 0,99), et l'âge avancé du jeune était associé à des probabilités plus faibles de mésentente au WHODAS 2.0 de 12 items (RC = 0,40, IC à 95 % = 0,19 à 0,84). **Conclusion:** Les propriétés psychométriques des deux versions du WHODAS 2.0 étaient semblables, donc la version abrégée peut suffire à mesurer la déficience fonctionnelle dans un contexte clinique. Il faut une recherche additionnelle pour mieux comprendre les facteurs qui influencent les divergences entre informateurs et les implications dans les soins. Cependant, les rapports tant des jeunes que des parents semblent valables pour comprendre la déficience fonctionnelle.

**Mots clés:** *santé mentale, entente, divergences entre informateurs, parents, jeunes, déficience fonctionnelle*

## Introduction

Approximately 18-22% of youth, ages 4 to 17 years, have experienced a mental disorder within the last six months (1). Mental disorders can be troubling for youth, resulting in both functional impairment and decreased health-related quality of life (2,3). Mental disorders in youth are associated with lower educational achievement, substance abuse, violence, and sexual health concerns (4). Further, compared to those without mental disorders, individuals experiencing a mental disorder early in life reported more problematic social relationships, poorer psychological health, and lower quality of life as adults (5).

As described by the International Classification of Functioning, Disability and Health (ICF), functioning is understood to be the outcome of the interaction between an individual's health condition and their context, that is their environmental and personal circumstances (6). Functional impairment moderates many of the negative effects of mental disorders (7). For example, individuals with substantial functional impairment because of mental disorder are more likely to have lower quality of life and use more healthcare compared to those with less impairment and those without a mental disorder (7). To minimize the impact of mental disorders, monitoring functional impairment is a clinical priority, often accomplished using health assessments.

Information provided on mental health assessments may differ depending on whether they are completed by parents or youth (8,9). Such discrepancies can have profound impacts on the effectiveness of care and the supports provided to youth with mental health disorders (10). Parental underestimates of youth illness severity have been shown to reduce the supportive care provided to youth, despite the need for such services (11). Additionally, higher parent-youth disagreement is associated with poorer health outcomes for youth (12). Without understanding the extent to which informant discrepancies exist, care plans and

treatment decisions for youth with mental disorders may be negatively impacted.

Both parent and child characteristics are known to influence levels of agreement. Evidence suggests higher maternal stress, parent psychopathology, child gender (male), and comorbid physical health problems in children are associated with more parent-youth disagreement (13,14). Child age is also likely to influence the extent of informant discrepancy. As youth become older, they are encouraged to take responsibility for their health, and parents are less likely to closely monitor health conditions that are not life-threatening. Older youth experience less parental involvement in their daily lives and are more likely to delay disclosing information until support is required (15).

Evidence shows that agreement between parent and youth reports of child mental health and quality of life is low, but the extent to which this phenomenon extrapolates to other aspects of youth health (i.e., functioning and disability), is unknown (8,16). The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) is a 36-item questionnaire that assesses functional impairment by considering six domains of functioning: cognition, mobility, self-care, getting along, life activities, and participation (6). The WHODAS 2.0 was developed from a large collection of items from the International Classification of Functioning, Disability and Health (ICF) and 36 items were selected by ICF experts based on psychometric and qualitative data (17). A 12-item version of the WHODAS 2.0 is also available which contains 2 items from each domain (18). Scores on the 12-item WHODAS 2.0 account for 81% of the variance in scores on the full version (17). Both the 36- and 12-item WHODAS 2.0 have self- and proxy-administered versions. In addition to being a respondent-centric assessment, another key advantage of the WHODAS 2.0 is its alignment with the atheoretical and polythetic model of the Diagnostic and Statistical Manual of Mental Disorders (DSM), which

is why the DSM recommends its use to determine functioning of psychiatric patients. The psychometric properties of the WHODAS 2.0 have been established across different populations; however, existing investigations have mostly focused on adult populations (17). There are two exceptions that have examined psychometric properties among youth as young as 12 years (19,20) but these studies focused on only youth informants and did not examine agreement between youth and parent responses. Furthermore, there are a lack of studies that include youth with chronic physical or mental illness and thus the psychometric properties of the WHODAS 2.0 among youth with a chronic illness, as well as the extent of informant agreement, are unknown.

The aims of this study were to: 1. Examine convergent and divergent validity, as well as internal consistency of the WHODAS 2.0 in a clinical sample of youth with mental disorders and their parents; 2. Estimate agreement in parent and youth responses to the WHODAS 2.0; and 3. Examine factors associated with disagreement between parent versus youth report.

## Materials and Methods

### Study Design and Sample

Data were drawn from a cross-sectional study that investigated the prevalence of mental-physical multimorbidity among children and youth ages 4-17 years who were receiving inpatient or outpatient mental health care at a pediatric academic hospital in Ontario (21). Participants screened positive on the Mini International Neuropsychiatric Interview (MINI-KID) (22) for at least one common mental disorder (major depressive episode, separation anxiety, phobia, generalized anxiety, attention-deficit/hyperactivity disorder, conduct disorder or oppositional defiant disorder), were receiving inpatient or outpatient mental health care, had a parent who was their primary caregiver for the three months prior to recruitment into the study, and could complete all study questionnaires in English. The study was approved by the Hamilton Integrated Research Ethics Board (15-197).

A total of 259 eligible participants were identified, 144 provided informed consent, and 92 child-parent dyads completed the study. Youth aged 14-17 years ( $n=66$ ) were eligible to provide self-reported data on the WHODAS 2.0 and the KIDSCREEN-27. If more than 50% of items in any WHODAS 2.0 domain were missing, the parent-youth dyad was removed from the analyses ( $n=10$ ), resulting in a final analytic sample of 56 dyads. The final analytic sample included 56 parent-youth dyads.

### Measures

The WHODAS 2.0 measures six domains of functioning: cognition (6-items), mobility (5-items), self-care (4-items), getting along (5-items), life activities (8-items) and participation (8-items). The 36-item version yields both overall and domain scores and typically takes 5-10 minutes to complete (6). A 12-item version, which yields an overall score, is also available and considers the items that most strongly loaded onto the domain-factor structure in the initial validation of the 36-item version (23). Respondents report the amount of difficulty they (or their child) had within the previous 30 days on a 5-point scale and item scores are summed and averaged (24). Therefore, scores range between one and five, with higher scores indicating greater functional impairment. In total, 80.3% of parents and 40.9% of youth did not answer a question about difficulty in sexual activities. Following a previous report, this item was removed from all analyses and a modified 35-item WHODAS was employed (25). Mean item imputation was used for participants who had  $\leq 50\%$  of missing WHODAS 2.0 data

Health-related quality of life was evaluated using the KIDSCREEN-27, which includes the following domains: physical well-being, psychological well-being, autonomy and parents, peers and social support, and school environment (26). Both parents and youth completed this questionnaire. The assessment typically takes 5-10 minutes to complete, and questions are asked on a 5-point scale. Higher scores indicate greater health-related quality of life. The KIDSCREEN-27 is a valid and reliable measure of health-related quality of life among youth with mental disorders and demonstrates measurement invariance between parent-youth dyads (20).

Youth stress was measured using the Perceived Stress Scale (PeSS), a 10-item parent-reported assessment that typically takes  $< 5$  minutes to complete (27). Questions ask about thoughts and feelings within the previous month and answers are provided on a 5-point scale. Higher scores indicate higher perceived stress. The factor structure, internal consistency, and convergent validity of the PeSS have been demonstrated as acceptable (28).

Parent psychological distress was quantified by taking the sum of scores on the Center for Epidemiologic Studies Depression Scale (CES-D) and the State-Trait Anxiety Inventory (STAI), as has been done in other settings (29,30). The CES-D is a 20-item measure of depressive symptoms within the previous week that takes approximately 5 minutes to complete (31). Parents report how often they felt a particular symptom on a 4-point scale, with higher scores indicating greater symptoms of depression. The psychometric properties of CES-D were found to be adequate in

an adult population (32). The STAI is a 40-item measure asking about general feelings of anxiety (33). In this study, only the 20 items focusing on trait anxiety (how individuals generally feel) were completed by parents. The STAI takes 10 minutes to complete, and respondents are asked to agree or disagree with a statement on a 4-point scale with higher scores indicating greater anxiety. The psychometric properties of the STAI have been shown to be adequate for a sample of parents who have youth with mental illness (34).

Sociodemographic variables (youth age, youth sex, parent age, and household income before taxes), and clinically relevant variables (care setting, and multimorbidity) were collected through parent surveys. Care setting indicated whether a participant was receiving in-patient or outpatient care. Multimorbidity indicated the presence of a co-occurring physical illness in youth.

### Statistical Analysis

Convergent validity was assessed by estimating the correlation between WHODAS 2.0 scores and each of the KIDSCREEN-27 domains. It was hypothesized that the scores on the WHODAS 2.0 would negatively correlate with KIDSCREEN-27 domain scores (i.e. greater functional impairment associated with lower health-related quality of life). Divergent validity was assessed by examining correlations between WHODAS 2.0 scores and demographic factors, including youth age, youth sex, and household income, as these characteristics are not expected to influence ratings of functioning (17,35). Youth-reports of the WHODAS 2.0 were compared to youth-reports of the KIDSCREEN -27 and parent-reports of the WHODAS 2.0 were compared to parent-reports of the KIDSCREEN-27. Kendall's  $\tau$  was used to quantify correlations between WHODAS 2.0 scores and continuous variables, and a point-biserial correlation coefficient ( $r$ ) was calculated to quantify correlations between WHODAS 2.0 scores and binary variables. Internal consistency of both the 35-item and each subscale and 12-item WHODAS 2.0 were examined by computing ordinal  $\alpha$ . Ordinal  $\alpha > 0.70$  was considered to indicate that internal consistency was adequate (36).

Descriptive statistics for overall and domain-specific WHODAS 2.0 scores were summarized separately for parent and youth groups and compared with paired t-tests. Bland-Altman plots with limits of agreement were constructed to assess agreement between parent and youth scores of both the 35- and 12-item WHODAS 2.0. A two-way mixed-effect model intraclass correlation coefficient (ICC) was computed for overall and domain specific scores. ICC values were interpreted as poor if  $< 0.5$ , moderate if between 0.5 to 0.75, good if between 0.75 and 0.90, and

excellent if  $> 0.90$  (37). Differences  $> 0.5$  standard deviations in overall WHODAS 2.0 scores within a dyad were considered to be clinically meaningful (38). Logistic regression was used to model demographic and clinical factors associated with clinically meaningful differences in the WHODAS 2.0 between parents and youth. The c-statistic was used to assess model fit.

All analyses were performed in SAS Studio, Version 9.0.4 (SAS Institute, Cary, NC). Hypothesis tests were two-sided with  $\alpha = .05$ .

## Results

The mean age of youth was 15.7 years ( $SD = 1.0$ ), and the majority were female (76.8%) and white (90.6%) (Table 1). There were approximately equal numbers of youth recruited from inpatient settings and outpatient settings. The mean age of parents was 47.5 years ( $SD = 6.1$ ), and most identified as female (83.9%). Household income was equally represented across categories and almost half of the sample (46.4%) had an annual household income  $< \$75,000$ .

Parent-reported WHODAS 2.0 scores were significantly lower than youth reported scores for both the 35-item (Parent mean score = 2.32, youth mean score = 2.63;  $p = .02$ ) and 12-item (Parent mean score = 2.40, youth mean score = 2.69;  $p = .04$ ) WHODAS 2.0. Correlations between WHODAS 2.0 overall scores based on both parent and youth report and KIDSCREEN-27 domain scores were low to moderate (Table 2). A positive correlation was observed between youth-reported psychological well-being and 35- and 12-item WHODAS scores based on youth report whereas, a negative correlation was observed between parent-reported reported psychological well-being and 35- and 12-item WHODAS scores based on parent report. All correlations between WHODAS 2.0 overall scores based on parent and youth report and demographic variables were low to moderate (Table 3). The direction of correlation was consistent for parents and youth, with the exception of youth age for which a positive correlation was observed with 35- and 12-item WHODAS scores based on youth report and a negative correlation was observed with 35- and 12-item WHODAS scores based on parent report.

The ordinal  $\alpha$  value was 0.96 for the 35-item WHODAS 2.0 with subscale  $\alpha$  values for cognition = 0.80, mobility = 0.78, self-care = 0.70, getting along = 0.74, life activities = 0.94, and participation = 0.90 based on youth report. For parental report, the ordinal  $\alpha$  value was 0.96 for the 35-item WHODAS 2.0 with subscale  $\alpha$  values for cognition = 0.90, mobility = 0.77, self-care = 0.76, getting along = 0.73, life activities = 0.93, and participation = 0.85. The

<b>Table 1. Demographic characteristics of parent-youth dyads (n= 56)</b>	
	Mean (SD)
Youth age (years)	15.8 (1.0)
Youth stress (PeSS score)	26.8 (8.0)
Parent age (years)	47.5 (6.1)
Parent psychosocial distress (CES-D + STAI scores)	66.3 (16.9)
	% (n)
Youth sex (Female)	76.8 (43)
Youth multimorbidity (yes)	26.8 (15)
Youth ethnicity (White)	90.6 (48)
Mental disorder:	
Major depressive episode	80.4 (45)
Generalized anxiety	76.8 (43)
Separation anxiety	30.4 (17)
Social Phobia	60.7 (34)
Specific Phobia	17.9 (10)
Attention-deficit/hyperactivity disorder	26.8 (15)
Oppositional defiant disorder	35.7 (20)
Conduct disorder	17.9 (10)
Parent sex (female)	83.9 (47)
Household income < \$75,000	46.4 (26)
Care setting (Inpatient) <sup>a</sup>	55.4 (31)
SD = standard deviation; PeSS = Perceived Stress Scale; CES-D = Center for Epidemiological Studies Depression Scale; STAI = State-trait Anxiety Inventory.	
<sup>a</sup> Youth was receiving either inpatient or outpatient mental health care.	

<b>Table 2. Convergent validity of the 35-item and 12-item WHODAS 2.0 for Parents and Youth</b>			
WHODAS 2.0	KIDSCREEN-27 Domain	Youth Report $\tau$ (p-value) <sup>a</sup>	Parent Report $\tau$ (p-value) <sup>b</sup>
35-item	Psychological well-being	0.01 (.91)	-0.07 (.45)
	Physical well-being	-0.31 (<.01)	-0.24 (.01)
	Autonomy and parent relations	-0.21 (.02)	-0.29 (<.01)
	Social support and peers	-0.09 (.33)	-0.23 (.02)
	School environment	-0.41 (<.01)	-0.40 (<.01)
12-item	Psychological well-being	<0.01 (.98)	-0.05 (.65)
	Physical well-being	-0.31 (<.01)	-0.30 (<.01)
	Autonomy and parent relations	-0.21 (.03)	-0.25 (.01)
	Social support and peers	-0.12 (.23)	-0.23 (.02)
	School environment	-0.41 (<.01)	-0.42 (<.01)
<sup>a</sup> Correlations between youth-reports of the WHODAS 2.0 and youth-reports of the KIDSCREEN -27.			
<sup>b</sup> Correlations between parent-reports of the WHODAS 2.0 and parent-reports of the KIDSCREEN-27.			
$\tau$ = Kendall's rank correlation coefficient			

Table 3. Divergent validity of the 35-item and 12-item WHODAS 2.0 for Parents and Youth			
WHODAS 2.0	Demographic variable	Youth report $\tau/r$ (p-value)	Parent report $\tau/r$ (p-value)
35-item	Female youth <sup>a</sup>	0.32 (.02)	0.29 (.03)
	Youth age <sup>b</sup>	0.03 (.75)	-0.12 (.22)
	Household income <\$75,000 <sup>a</sup>	-0.03 (.85)	-0.09 (.51)
12-item	Female youth <sup>a</sup>	0.30 (.03)	0.23 (.08)
	Youth age <sup>b</sup>	0.07 (.48)	-0.08 (.42)
	Household income <\$75,000 <sup>a</sup>	-0.06 (.68)	-0.09 (.49)

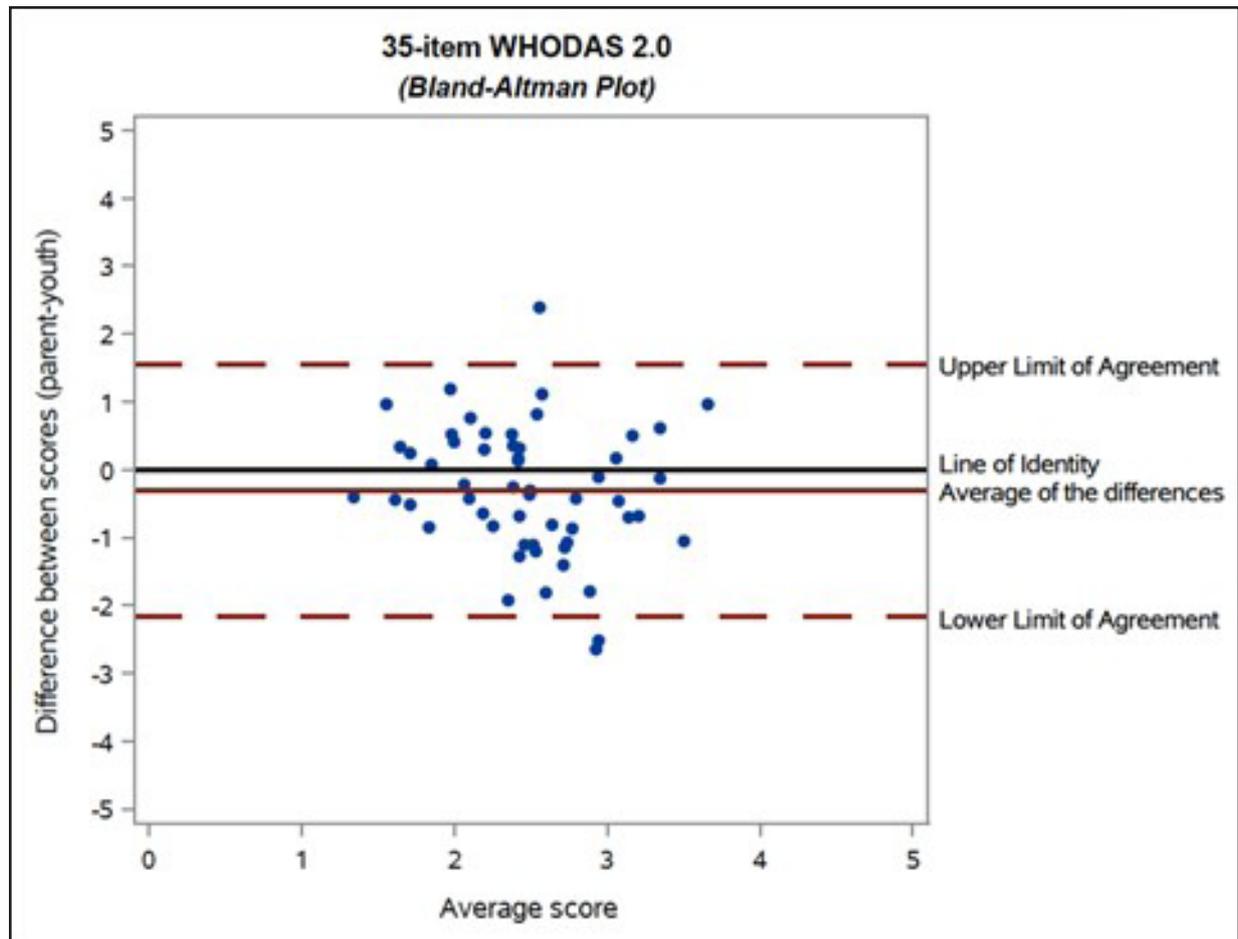
$\tau$  = Kendall's rank correlation coefficient;  $r$  = point biserial correlation coefficient.  
<sup>a</sup>Point-biserial correlation.  
<sup>b</sup>Kendall's  $\tau$ .

Table 4. Two-way mixed effect model ICC for Parent-youth agreement on the WHODAS 2.0	
WHODAS 2.0	ICC (95% CI)
35- item	0.07 (-0.19, 0.3)
Cognition	-0.04 (-0.29, 0.22)
Mobility	0.15 (-0.11, 0.40)
Self-care	0.33 (0.08, 0.54)
Getting along	0.13 (-0.14, 0.37)
Life activities	0.17 (-0.09, 0.41)
Participation	0.20 (-0.06, 0.43)
12- item	0.02 (-0.24, 0.28)

ICC values computed for overall (35- and 12-item versions) and domain specific scores.  
 ICC = intraclass correlation coefficient

Table 5. Logistic regression model of demographic and clinical factors associated with meaningful differences on the WHODAS 2.0		
Variables	35-item WHODAS 2.0 OR (95% CI)	12-item WHODAS 2.0 OR (95% CI)
Youth age (years)	0.58 (0.31, 1.08)	0.40 (0.19, 0.84)
Youth sex (female)	1.74 (0.38, 8.01)	1.69 (0.36, 8.03)
Household Income <\$75,000	0.28 (0.08, 0.99)	0.38 (0.10, 1.45)
Multimorbidity	0.74 (0.18, 3.13)	0.57 (0.12, 2.66)
Youth Stress	1.01 (0.92, 1.10)	1.07 (0.97, 1.17)
Parent psychosocial distress	1.01 (0.98, 1.05)	0.99 (0.95, 1.03)
Inpatient	0.53 (0.11, 2.56)	0.33 (0.06, 1.88)
c-statistic	0.71	0.76

Differences > 0.5 standard deviations in overall WHODAS 2.0 scores within a dyad were considered to be clinically meaningful.  
 The reference categories for dichotomous variables were: male sex; household income > \$75,000; no multimorbidity; and receiving outpatient mental health services.

**Figure 1. Bland-Altman Plot of agreement between Parents and Youth for 35-item WHODAS 2.0**

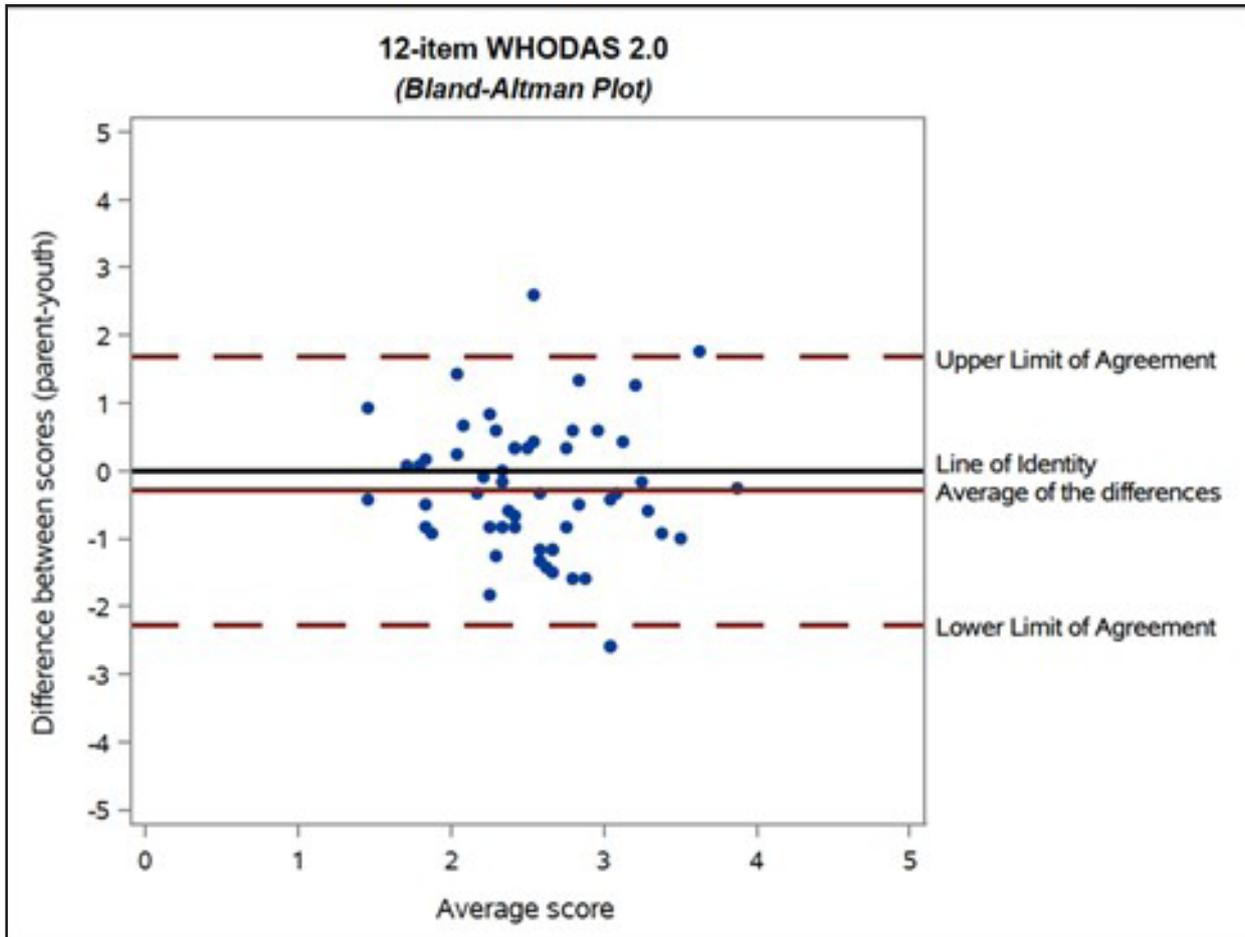
ordinal  $\alpha$  values for youth and parent report for the 12-item WHODAS 2.0 version were 0.86 and 0.91, respectively. The Bland-Altman plots are presented in Figures 1 and 2. For both versions of the WHODAS 2.0, the points were scattered equally above and below the line of identity and did not extend to the limits of the x-axis or y-axis and the limits of agreement for both plots are wide. All ICC values were  $<0.5$ , indicating poor agreement between parent and youth reports (Table 4). Household income  $< \$75,000$  was associated with lower odds of meaningful differences between scores based on youth and parent reports. Higher youth age was associated with lower odds of meaningful differences between parent and youth 12-item but not 35-item WHODAS 2.0 scores (Table 5). No other covariates

were associated with meaningful differences in scores on the 35-item or 12-item versions of the WHODAS 2.0.

## Discussion

This study demonstrates that the WHODAS 2.0 has adequate internal consistency and divergent validity, however, it may not correlate with all domains of health-related quality of life scores. In addition, parent and youth agreement is low.

Divergent validity was consistently demonstrated for both parent and youth reports on the WHODAS 2.0, while convergent validity was not. Correlations between WHODAS 2.0 scores and psychological well being and social support and peers were low, indicating lack of convergent validity

**Figure 2. Bland-Altman Plot of agreement between Parents and Youth for 12-item WHODAS 2.0**

with respect to these domains of health-related quality of life. The study sample consisted of youth with mental illness and the lack of correlation between psychological wellbeing and WHODAS scores may be due to a floor effect of the KIDSCREEN scores. Rajmil et al. (39) found that both psychological well-being and social support and peers domains of the KIDSCREEN significantly decreased as scores of mental health deteriorated in youth ages 8 to 18 years. Therefore, there may be less variability present in this sample within these domains of health-related quality of life, resulting in no covariation with WHODAS 2.0 scores. Youth and parent-reported correlations between KIDSCREEN-27 domains and WHODAS 2.0 scores were similar in direction and magnitude, suggesting a similar pattern of construct validity across informants. Consistent with

other investigations in youth with mental disorders, the internal consistency of the 35-item and 12-item WHODAS 2.0 based on both parent and youth informants was greater than 0.7 indicating adequate internal consistency (6,25).

Parent-youth agreement on the WHODAS 2.0 was poor, with lower parent-report scores for both the 12-item and 35-item versions. This finding aligns with other studies exploring parent-youth agreement in the context of mental disorders (8,38,40). The findings support the assertion that parents and youth each provide discrepant, but valuable perspectives (14). There is growing evidence of measurement invariance of WHODAS 2.0 scores between youth  $\geq 10$  years and their parents (40) indicating that youth and their parents are similarly interpreting the construct of

functioning, therefore disagreement observed between respondents likely represents real differences in perceptions of functioning. Considering that youth in this sample were reporting greater functional impairment compared to their parents, it is possible that collecting only parent-report information could result in a child's functional impairment going under-noticed (14). Conversely, there may be instances where parents observe functional impairments when their child does not, and these concerns would also clearly be valuable to acknowledge and address in a clinical setting (14). Similarly, an investigation in a school-based sample identified that parents underestimated the emotional distress symptoms of youth (41). However, in a sample of predominantly ethnic minority youth receiving outpatient mental health support, parents reported higher functional impairment compared to youth (42). Because most youth in this study identified as white, it is possible that the direction of informant discrepancies may be explained, in part, by ethnicity. Other research suggests ethnicity may influence the magnitude and direction of informant discrepancies (43). Parents from ethnic minorities may have unique thresholds, compared to youth and non-minority parents, when determining if medical attention for poor mental health is needed. For example, Carlston and Ogles (2009) found greater agreement between parent and youth reports of behavioural and emotional symptoms among Hispanic families compared to white and African American and posited this may be due to cultural differences in family dynamics such that Hispanic families may have a stronger sense of familiar unity and thus have greater communication between parent and youth resulting in greater agreement. The discrepancy between parents and youth may also be explained by slight divergence between conceptualizations of functioning. A 2010 study (44) examined a series of studies to determine the coherence of the ICF model when applied to childhood intervention and habilitation services for children and found that overall the ICF model is feasible and useful among this population, however children prioritized the perception of engagement and motivation within the participation domain which are not constructs within the ICF. Since the WHODAS 2.0 is derived from the ICF model, we can be reasonably confident that the instrument is conceptually valid in the application to youth 14-17 years; this is further supported by evidence of measurement invariance between youth 15-19 years and adults and between youth with and without physical or mental conditions (18,19,40). However, it is noted that there may be aspects of functioning that are relevant to children and youth (i.e. perception of engagement and motivation) that are not captured by the ICF and subsequently, the WHODAS 2.0, thus, rendering disagreement between parents and youth reports. Considering both

the disagreement between informants and the necessary removal of the item regarding sexual activity due to missing data, qualitative investigation into the conceptualization of functioning among youth with a chronic physical illness may be warranted to further explore discrepancies between parents and youth.

Our finding that household income <\$75,000 was associated with lower odds of meaningful disagreement between parent and youth 35-item WHODAS 2.0 scores conflicts with other literature (45). Youth in low-income households have higher rates of mental illness and the highest unmet need for mental health support (46). However, barriers to care faced by those in low-income households may result in a shared understanding about mental health concerns, increasing the odds of agreement. More research to substantiate or refute this hypothesis is needed. Older youth age was associated with lower odds of meaningful differences between parent and youth 12-item WHODAS 2.0 scores. This is consistent with some previous work (13,16), and suggests that although youth may be less likely to seek support from parents as they mature, they may be better able and willing to communicate concerns when they do. However, some studies report the opposite association (47) and others find no association (48), underscoring the need for future research.

A limitation of the current study is the rate of non-response from eligible families. The sample size utilized within this study is similar to other investigations of parent-youth agreement ( $n=62$ ) (49), however, is likely underpowered. With only 2 observations per participant (i.e. youth and parent), a sample size range of 66 to 152 would be required to detect and ICC of 0.2 to 0.3 with 80% power (50). Additionally, a sample size of 85 would be needed to detect a medium correlation for convergent validity with 80% power (51). Furthermore, with only 37 dyads exhibiting meaningful differences, the logistic regression model is underpowered to provide robust estimates of association between demographic and clinical factors and disagreement. However, a 2012 study found that estimates of reliability and validity of patient reported scales remain relatively stable (i.e. within  $\pm 0.1$  points) in samples as small as  $n=40$  (52). Therefore, while power may be limited, estimates derived from this data and our subsequent interpretations may be representative of findings conducted with larger samples. Additionally, the sample was also fairly homogeneous, therefore the findings cannot be generalized to all youth with mental disorder and, as most parent informants were female, the results may not be generalizable to father-youth dyads. Lastly, the use of mean item imputation for missing data likely underestimated the variability of the WHODAS

2.0 scores; however, imputation was completed for each of the domains within the WHODAS 2.0 and a dyad was only included if at least 50% of each domain was not missing. As a result, it is less likely that reductions to the variability made a meaningful difference in determining parent or youth WHODAS 2.0 scores.

Overall, the psychometric properties of both versions of the WHODAS 2.0 were similar, regardless of the informant. This study supports the notion that youth and parent informants provide unique and valuable perspectives on functional impairment, suggesting information should be collected from both in clinical and research settings to ensure that concerns from either parents or youth regarding functional impairment do not go unrecognized.

Given the negative impact that informant discrepancies has on health outcomes for youth (12,53), considering multiple perspectives may better allow health professionals to provide optimal supports and care to youth with mental disorders. In alignment with the core tenants of family centered care (54,55), identifying needs and care planning should consider both perspectives and potential divergence in perceptions may, itself, be an entry point for investigating family functioning concerns useful to explore in family interventions. The foundations of family centered care include participation and collaboration between parents, youth, and health professionals with the goal of improving health outcomes and maintaining dignity and respect for the individual and their family (54,55). Family centered care has robust evidence of parent and youth satisfaction with care as well as better youth outcomes (56). Therefore, operating within a family centered care approach, it is possible that identifying discrepancies between parents and youth perceptions of functioning may prompt further examination into the family environment and functioning and may lead to intervention to improve communication between members of the family. Therefore, theoretically, with improved communication between parents and youth, agreement between assessments may also be improved; as evidence suggests that parent-youth agreement is associated with better youth outcomes, this would be a worthwhile goal for health professionals to help families achieve (12,53). From an evaluative perspective, outcome measures could be incorporated into evaluation programs that examine changes to the alignment in perspectives or outcome measures unique to parents and family following intervention. Additionally, it is essential to engage families during the research planning phase to select measures of function that are meaningful and relevant to both parent and child. Open communication between health professionals, parents and youth may lead to reduced informant discrepancies and better health

outcomes and is consistent with calls for multiparty medical interactions advocated by medical communications research (57,58). Further, given that the psychometric properties of both versions of the WHODAS 2.0 were similar, the 12-item WHODAS 2.0 may be preferred in clinical settings to reduce both provider and respondent burden.

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## Conflict of Interest

The authors have no financial relationships or other ties to disclose.

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