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VIQ-PIQ Discrepancies are Unrelated to Mental Health Indicators in a Child Psychiatric Sample

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Abstract: In a sample of children aged 8-16 years ($N = 151$) in a child psychiatric setting, the relationship between VIQ-PIQ discrepancies and both Quality of Life (QoL) and psychosocial problems was explored. It was hypothesized that compared to children without a VIQ-PIQ discrepancy children with a discrepancy would have lower QoL and show more psychosocial problems. Using the WISC-III to measure IQ discrepancies, QoL and the severity of psychosocial problems (measured with the Child Behavior Checklist) were found not to differ between the two groups of children. Neither were there any significant correlations between VIQ-PIQ discrepancies and these mental health indicators. Moreover, the proportion of children showing a VIQ-PIQ discrepancy was found not to deviate from the value in the normal population. The conclusion is that in children with psychiatric problems, VIQ-PIQ differences and core mental health indicators are unrelated and that therefore in diagnostic practice psychologists should be hesitant in assuming such a relationship.

Keywords: Intelligence, VIQ-PIQ discrepancy, quality of life, psychosocial problems, child psychiatry.

The Wechsler Intelligence Scale for Children Third Edition (WISC-III) [1] has been one of the most frequently used tests of intelligence worldwide. Since the date of its introduction newer versions of the test, WISC-IV and WISC-V [2, 3], have appeared, but the WISC-III is still used in European countries where translations of the newer versions are unavailable.

An important application of the WISC-III apart from determining Full Scale IQ (FSIQ) has been profile analysis, i.e. studying the discrepancy between Verbal IQ (VIQ) and Performance IQ (PIQ). Although the analysis of such a discrepancy has a long history [4, 5], it cannot persist, since the WISC-IV and WISC-V no longer apply the concepts of VIQ and PIQ. The WISC-IV in addition to FSIQ as a measure of a general factor "g", however, provides four indexes: the Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI) and Processing Speed Index (PSI). The WISC-V provides five indexes, by splitting PRI in a Visual Spatial Index (VSI) and a Fluid Reasoning Index (FRI). With the more recent developed Wechsler intelligence scales the tradition of analyzing differences between verbal and non-verbal abilities thus seems to be continued, but now based on discrepancies among the indexes instead of IQ-scores [6-8].

A VIQ-PIQ discrepancy on the WISC has been associated with problems in psychological functioning [9, 10]. Different relationships have been found for VIQ < PIQ and VIQ > PIQ profiles. Among children with learning disabilities, those with the VIQ > PIQ profile were shown to have a tendency towards more severe psychopathology [11] and, more specifically, more symptoms of depression [12]. In a recent study in children and adults with Klinefelter syndrome, the VIQ > PIQ group had increased levels of schizotypal traits and the VIQ < PIQ group showed increased levels of autism traits [13]. According to the authors of the latter publication such findings are in line with the suggestion that verbal deficits are related to problems in communication and imagination, i.e. to autism traits, whereas perceptual organization deficits are related to problems in the integration of contextually related information across time and space, i.e. to schizotypal traits. Several studies seem to confirm the presence of higher nonverbal than verbal cognitive abilities in children with autistic spectrum disorders [14-16]. On the other hand it was found in a sample of high-functioning school-aged children with autistic spectrum disorders that discrepant cognitive abilities in either direction were associated with more autism symptoms [17]. All these studies support the widespread belief that patterns of cognitive performance as revealed by a VIQ-PIQ discrepancy are related to psychosocial functioning.

However in contrast to the studies described above, it was found in another study [18] that several

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diagnostic groups in child psychiatry could not be distinguished on the basis of WISC profiles. Based on a broad overview of the literature the argument has been made that specifically with regard to autism the VIQ < PIQ profile may lack sensitivity as it has not been found consistently [19, p. 367]. Furthermore, in the general population, VIQ-PIQ discrepancies do not seem to be predictive of neurodevelopmental or behavioral problems [20].

Analyses of discrepancies between VIQ and PIQ (or the newer index-scores) continue to be carried out in clinical practice, however, in spite of the lack of a theoretical or firm empirical foundation. In the light of the contradictory evidence and suggestions cited above it remains important to examine if a relationship between VIQ-PIQ discrepancies and psychosocial problems exists in both the general population and specific diagnostic groups.

With regard to psychosocial wellbeing, Quality of Life (QoL) is nowadays considered an important outcome measure in health care and in child psychiatry [21]. QoL was defined by the World Health Organization as “the individual’s perception of his/her position in life in the context of the cultural and values systems in which he/she lives, and in relation to his/her goals, expectations, standards and concerns. It is a wide ranging concept incorporating in a complex way the person’s physical health, psychological state, level of independence, social relationships, personal beliefs and relationship to salient features of the environment” [22, p. 43].

One of the important domains of QoL is health, both physical and psychological. The relationship between physical health and QoL has been studied extensively and QoL is thought to be an important component of health surveillance that should be routinely included in clinical research as an outcome indicator [23].

Studies have suggested that children referred for psychiatric problems such as depression, conduct disorder, or ADHD experience a QoL that is equal to or even poorer than QoL in children with a chronic physical condition [24, 25]. No relationship has been found between general IQ level and QoL [26, 27]. To our knowledge, no research has been done regarding the relationship between VIQ-PIQ discrepancies and QoL.

The present study explored the relationship between a VIQ-PIQ discrepancy and both psychosocial problems and QoL in a child psychiatric sample. Based

on the results of previous studies, especially those among children with autism traits, it was hypothesized that children in our sample with a VIQ-PIQ discrepancy would show more psychosocial problems than children without such a discrepancy. Also based on previous findings [11], it was expected that children with a VIQ > PIQ profile would show the most severe psychosocial problems. In addition it was hypothesized that specifically children with a VIQ > PIQ pattern would have a lower level of QoL. And finally, if it is true that the presence of a discrepancy is a general indicator of maladjustment, it could be hypothesized that the proportion of children with a VIQ-PIQ discrepancy would also be above base rate.

METHOD

Participants

A total of 151 children (mean age = 12.4 years, range 8-16 years, 59.6% male) who were referred to a Dutch center for child psychiatry participated in this study. As part of the standardized procedure, data of QoL and behavioral problems were collected during the intake phase. Only children who were indicated for additional testing with respect to intelligence by using the WISC-III-NL [28] were included. These were children who, for example, were suspected of learning problems, possible giftedness or intellectual disability. About 20% of all referred children were referred for intelligence measurement. The study was approved by the center’s Ethics Committee, and informed consent was obtained from (the parents of) all individual participants included in the study. Descriptive statistics of the sample are given in Table 1.

Measures

Intelligence

FSIQ, VIQ and PIQ were calculated by using the WISC-III-NL. A significant IQ discrepancy was defined as a difference between VIQ and PIQ of at least 15 points. This difference was based on the IQ discrepancies that reached statistical significance ($p < .05$) according to the Dutch administration manual of the WISC-III, and on the IQ-split level of 15 points used in other studies on VIQ-PIQ discrepancies [29, 30].

Quality of Life

The KIDSCREEN-52 [31] was used as a measure of health related QoL. It assesses children’s and adolescents’ subjective health and well-being. The instrument was conceived as a self-report measure

applicable to healthy and chronically ill children and adolescents (with ages ranging from 8 to 18 years). The KIDSCREEN-52 measures 10 health related QoL dimensions: Physical Well-being (5 items), Psychological Well-being (6 items), Moods and Emotions (7 items), Self-Perception (5 items), Autonomy (5 items), Parent Relations and Home Life (6 items), Social Support and Peers (6 items), School Environment (6 items), Social Acceptance (Bullying) (3 items) and Financial Resources (3 items). In this study both the child and adolescent version and the parent/proxy version of the KIDSCREEN-52 were used.

Psychosocial Problems

As a measure of psychosocial problems, the Child Behavior Checklist (CBCL) developed by Achenbach [32] and translated into Dutch [33] was used. The CBCL consists of 113 problem-behavior items. There are eight subscales, some of which are combined to measure "Internalizing Problems" and others to measure "Externalizing Problems", while all items together combine into "Total Problems". The CBCL is used as a screening instrument that is filled out by parents and is useful in detecting children with and without psychosocial problems.

RESULTS

Descriptive Statistics

As shown in Table 1, the VIQ < PIQ, VIQ = PIQ, and VIQ > PIQ groups differed significantly from each other on FSIQ, VIQ, and PIQ scores. It can be seen that the discrepant groups had the highest full scale IQ levels. There were no group differences in age or gender ratio.

Prevalence of a VIQ-PIQ Discrepancy

It was hypothesized that the proportion of children with a discrepancy between VIQ and PIQ would be

larger than base rate. A two-tailed z approximation test was conducted to assess whether the proportion of VIQ ≠ PIQ in the present sample deviated from .268, which is the value regarded as the normal base rate of a VIQ-PIQ discrepancy of 15 points or more [34]. The observed proportion of .265 did not differ significantly from the hypothesized value of .268 (two tailed $p = .94$). The difference is so small that according to a power analysis (with power = .80) over 60.000 subjects would be needed to reach significance. Splitting the VIQ ≠ PIQ group into a VIQ < PIQ and a VIQ > PIQ group revealed other results. The observed proportion of VIQ < PIQ in our sample was .073 and this differed significantly from the expected value in the normal population of .127 (two tailed $p = .005$). The observed proportion of the VIQ > PIQ profile type in our sample was .192 and this did not differ significantly from the expected value of .141 (two tailed $p = .07$). These results suggest that in a psychiatric setting there is a lower than normal proportion of children with a VIQ < PIQ profile and a trend towards a higher than normal proportion of VIQ > PIQ profiles.

Quality of Life

The mean values and the differences between the two groups (VIQ ≠ PIQ and VIQ = PIQ) on the dimensions of the KIDSCREEN-52 self report and the KIDSCREEN-52 parent report are shown in Tables 2 and 3, respectively. MANOVA testing for group differences on the ten KIDSCREEN dimensions simultaneously, showed that Wilks's $\Lambda = .96$, $F(10, 134) = 0.61$, $p = .80$ for the self report, and Wilks's $\Lambda = .92$, $F(10, 134) = 1.11$, $p = .36$ for the parent report data. The differences in means on the separate dimensions were very small (all smaller, and most much smaller than 0.43 SD). These non-significant results together with the very small effect sizes suggest that there are no differences in level of QoL between children with and without a VIQ-PIQ discrepancy.

Table 1: Sample Characteristics: Means with Standard Deviations within Parentheses

	Total sample (N = 151)	VIQ < PIQ (n = 11)	VIQ=PIQ (n = 111)	VIQ > PIQ (n = 29)	Statistic*	p
Age	12.4 (2.7)	12.8 (2.7)	12.8 (2.8)	12.7 (2.7)	$F = 0.03$.97
Gender (% male)	59.6	54.5	57.5	69.0	$\chi^2 = 1.3$.51
Full scale IQ	93.2 (14.1)	99.7 (14.9)	91.5 (14.2)	97.6 (12.4)	$F = 3.5$.03
Verbal IQ	95.4 (14.3)	89.4 (13.1)	92.7 (13.2)	108.2 (11.7)	$F = 17.8$	<.001
Performance IQ	92.2 (14.5)	112.4 (14.6)	91.8 (13.6)	86.3 (11.3)	$F = 15.7$	<.001
IQ difference (VIQ-PIQ)	3.2 (13.3)	-23.0 (5.9)	1.0 (7.8)	21.8 (6.9)	-	-

*The test statistics were calculated on the data of the three IQ groups, after splitting up the total sample.

Table 2: Mean Scores and Standard Deviations on the KIDSCREEN Child Self Report for the Groups with and without a VIQ-PIQ Discrepancy

	VIQ ≠ PIQ (n = 39)	VIQ=PIQ (n = 106)	Difference
Physical Well-being	49.8 (11.5)	51.2 (12.2)	1.4
Psychological Well-being	45.8 (10.3)	45.5 (11.0)	-0.3
Moods and Emotions	46.3 (11.9)	42.7 (12.4)	-3.6
Self-Perception	48.7 (8.7)	48.4 (10.6)	-0.3
Autonomy	49.6 (8.2)	49.1 (8.3)	-0.5
Parent Relations and Home Life	47.7 (9.9)	47.0 (11.4)	-0.7
Social Support and Peers	47.8 (9.9)	47.4 (11.2)	-0.4
School Environment	47.5 (8.8)	46.9 (10.4)	-0.6
Social Acceptance	44.0 (13.5)	41.6 (14.7)	-2.4
Financial Resources	48.7 (10.7)	47.3 (10.5)	-1.4

Note: all scores are *T*-scores ($M = 50$; $SD = 10$ in the sample representing the total population).

Table 3: Mean Scores and Standard Deviations on the KIDSCREEN Parent Report for the Groups with and without a VIQ-PIQ Discrepancy

	VIQ ≠ PIQ (n = 38)	VIQ=PIQ (n = 108)	Difference
Physical Well-being	46.8 (13.2)	47.9 (12.7)	1.1
Psychological Well-being	38.0 (14.2)	42.3 (12.1)	4.3
Moods and Emotions	37.2 (13.4)	36.2 (15.4)	-1.0
Self-Perception	44.8 (10.3)	45.4 (10.5)	0.6
Autonomy	50.8 (7.6)	52.3 (7.2)	1.5
Parent Relations and Home Life	43.8 (10.0)	44.3 (11.4)	0.5
Social Support and Peers	43.6 (9.5)	45.7 (11.1)	2.1
School Environment	42.9 (9.9)	43.0 (10.5)	0.1
Social Acceptance	40.9 (12.4)	37.7 (16.2)	-3.2
Financial Resources	49.5 (10.7)	49.5 (8.7)	0.0

Note: all scores are *T*-scores.

A second MANOVA was carried out to investigate the influence of the absence or the specific direction of a VIQ-PIQ discrepancy (VIQ < PIQ; VIQ > PIQ; VIQ = PIQ) on the ten dimensions of the KIDSCREEN-52. Again, no significant differences were found among the IQ-profile groups with regard to the self report form (Wilks's $\Lambda = .86$, $F(20, 266) = 1.07$, $p = .38$), nor with regard to the parent report form (Wilks's $\Lambda = .87$, $F(20, 266) = 0.98$, $p = .48$).

Correlation coefficients using the full sample were calculated between the discrepancy scores (both the absolute values and the scores themselves) and the dimensions of the KIDSCREEN-52 (self as well as parent report). Even without a conservative correction to control for Type I errors across the many tests, only one coefficient out of these forty ($r = .17$ for Social

Acceptance) reached significance ($p = .04$). The other correlations were all smaller than .14. These results corroborate the negative findings about a possible relationship between IQ discrepancies and QoL presented above.

Psychosocial Problems

Three independent samples *t*-tests on the CBCL scales for Internalizing Problems, Externalizing Problems, and Total Problems, respectively, were conducted to investigate the hypothesis that children with a VIQ-PIQ discrepancy would show more psychosocial problems than children without such a discrepancy. As can be seen in Table 4, there was no significant difference between the two groups on any of these scales.

Table 4: Mean T-Scores and Standard Deviations on the CBCL Scales Internalizing Problems, Externalizing Problems, and Total Problems

	VIQ ≠ PIQ (n = 40)	VIQ=PIQ (n = 107)	t (df = 145)	p-value
Internalizing Problems	67.9 (9.8)	66.2 (10.1)	0.90	.37
Externalizing Problems	63.6 (11.6)	62.9 (10.6)	0.37	.72
Total Problems	67.8 (9.7)	67.2 (8.2)	0.36	.72

MANOVA's were carried out again to check for differences between the discrepant and non-discrepant profile groups on the eight CBCL subscales. The first MANOVA considered a two-group distinction (VIQ ≠ PIQ vs. VIQ = PIQ) and the second a three-group one (VIQ < PIQ; VIQ > PIQ; VIQ = PIQ). No significant differences on the subscales of the CBCL were found in either the two- or the three-group analysis: Wilks's Λ for the first MANOVA = .96, $F(8, 138) = 0.79$, $p = .62$, and for the second MANOVA Wilks's $\Lambda = .93$, $F(16, 274) = 0.66$, $p = .83$.

Finally, correlation coefficients using the full sample were computed between the absolute values of the discrepancy scores (VIQ minus PIQ) and the 11 scales of the CBCL. The same was done for the discrepancy scores themselves. The highest correlation thus obtained was .17 and almost all other values were close to zero. Even without a correction for multiple tests, none of the coefficients proved to be significant.

Although we preferred to treat the clinical sample researched here as constituting one singular group, we had diagnostic labels available for the individual children, separating them into children with either Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Anxiety disorders or Mood disorders (AM), or an unspecified or other disorder (OTHER), respectively. The children had received these diagnoses on the basis of clinical judgment in a multidisciplinary team. When arranging a two-way table relating a harmonic (VIQ = PIQ) versus a disharmonic (VIQ > PIQ and VIQ < PIQ) profile to the four diagnostic categories, some distinctions among the groups arose. While 27% of the total sample had a disharmonic profile, a relatively large proportion (38%; 16 out of 42) of the children in the ASD group had such a profile. In the AM group 29% (6 out of 21) had a disharmonic profile, and in the ADHD and OTHER groups, these numbers were 21% (11 out of 51) and 19% (7 out of 37), respectively. This association was not statistically significant, however ($\chi^2(3) = 4.66$; $p = .20$).

DISCUSSION

This study aimed at investigating the relationship between IQ discrepancies on the one hand and Quality of Life (QoL) and psychosocial problems on the other, in children aged 8-16 years in a child psychiatric setting. We hypothesized that children with a discrepancy between VIQ and PIQ would have a lower level of QoL and more psychosocial problems as compared to children without such a discrepancy. We also hypothesized that children with a VIQ > PIQ profile would have more severe psychosocial problems than the other IQ-profile groups. Finally, we hypothesized that a discrepancy between VIQ and PIQ would be present more frequently in a child psychiatric than in a normal population.

No differences with regard to QoL or psychosocial problems were found between the groups of children with and without a VIQ-PIQ discrepancy, however, nor were there any associations between the size of the discrepancies and these measures. Moreover, we found that the proportion of VIQ-PIQ discrepancies in our sample was identical to the value in the normal population. Based on both the absence of significant differences and the small sizes of the obtained effects, we conclude that in a child psychiatric setting a relationship between IQ discrepancies and Quality of Life and psychosocial problems probably does not exist.

The results of the present study on psychosocial problems are in line with earlier research in a child psychiatric sample [18], where no preponderance of VIQ-PIQ discrepancies (of 15 points or more) was found. The VIQ-PIQ discrepancies of the latter study were also not related to outcomes on the CBCL scales. Furthermore, the present results correspond to the findings of Canivez [35]. He performed additional VIQ-PIQ analyses on a study relating outcomes of the WISC-III and the Adjustment Scales for Children and Adolescents [36] to academic achievement. With a sample ($N = 207$) of various students (non-disabled,

learning disability, intellectual disability, and emotional disability) non-significant and very small correlations were found between VIQ-PIQ discrepancies on the one hand and all syndrome and global adjustment scales on the other. There were no significant differences in VIQ-PIQ discrepancies among the four student groups. In a large explorative and epidemiological study on IQ level and IQ profile of children with ASD [15], evidence of a higher proportion of VIQ-PIQ discrepancies in this group was found, especially of the VIQ < PIQ profile. The authors of this study concluded, however, that the presence of such a discrepancy was not associated with higher levels of social impairment. In our sample we also found a higher incidence, although non-significant, of a disharmonic IQ profile among children with ASD.

The present study on the relationship between cognitive profiles, QoL and psychosocial problems across several psychiatric classifications fits into the research line described by Coghill [37]. He stressed the importance of investigating the consequences of specific cognitive deficits in terms of impairment in daily life regardless of specific psychiatric disorders. Taken together, the results of the above studies [18, 35] as well as our own research do not support the belief that a specific pattern of cognitive performance is associated with more or fewer psychosocial problems.

There are, however, some limitations to the present study. First, the sample may have been different from the general child psychiatric population. That is, the WISC-III was not administered to all referred children but only children with an indication for additional testing were included. Among these indications was, for example, a suspected VIQ-PIQ discrepancy as a sign of Nonverbal Learning Disabilities (NLD) [10, 11]. This referral bias might have influenced the results and possibly contributed to the fact that a significantly lower proportion of VIQ < PIQ profiles and a trend towards a higher proportion of VIQ > PIQ profiles, which is an alleged marker for NLD, were found in our study. Another bias might be that children with VIQ < PIQ patterns are less likely to be referred to a center for child psychiatry and thus were actually underrepresented. These children are probably more often referred to centers for children with communication and/or hearing impairments. Second, the sample size of the VIQ < PIQ group ($n = 11$) was small, which must have limited the power of the statistical tests that were conducted.

The fact that in children referred to a center of psychiatry there was no evidence of a relationship

between VIQ-PIQ discrepancies and QoL suggests that IQ discrepancies are of minor interest in QoL research. On the basis of the present data we could reach the same conclusion with regard to psychosocial problems. Contrary to this, Kaufman and Lichtenberger [19, chap. 9] showed that on a group level adolescents and adults with psychiatric disorders (schizophrenia, depression, and bipolar disorder) do have a larger VIQ than PIQ. This is still far, however, from saying that the VIQ > PIQ profile is evidence or even a marker of such a disorder [35].

The results together imply that when analyzing VIQ-PIQ discrepancies of the WISC-III for diagnostic purposes and probably also when analyzing VCI-PRI discrepancies of the WISC-IV in a similar fashion, clinicians should be reluctant in assuming that a direct link between these discrepancies and mental health indicators exists.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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