Intellectual Profiles of Children with Autism Spectrum Disorder

Identification of verbal and nonverbal subscales predicting intellectual quotient

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Abstract

**Objective:** Intelligence profile with age and gender differentials analysis and identification of a battery of subscales of intelligence are important for clinical management of ASD problems among children as well as in facilitating placement for remedial and educational services. Hence, this study aims to explore the intelligence quotient (IQ) profile among children with ASD and identify the most important subscales that predict the IQ. **Method:** The study is based on data collected through an exploratory study of 100 children aged between 3 and 13 years, who were referred to the department of child health and development in a tertiary hospital in Oman between June 2016 - June 2019. **Results:** Among the participants of this study, 79% were males, resulting in a male: female ratio of 4:1. The mean of full-scale IQ was found to be 68.58±18. The mean of non-verbal IQ (73.5±17.5) was significantly higher than the mean of verbal IQ (65.46±17.6). More than half (61%) of the children were observed to have mild to moderate impairment in IQ level. **Conclusion:** Age and gender showed no significant association with intelligence level. Regression analysis identified non-verbal fluid reasoning, non-verbal visual-spatial processing, non-verbal working memory and verbal
knowledge as the significant predictors of total IQ. The significant dimensions of verbal and non-verbal IQ identified in this study can be used to evaluate difficult cases.

**Keywords**: Autism, Oman, Intellectual profile, prediction

**Advances in Knowledge**
- The intellectual profile of Omani autistic children was described on Stanford Binet (fifth edition) scale.
- A prediction of the total IQ of Omani autistic children was carried from the most important verbal and non-verbal subscales.

**Application to Patient Care**
- The prediction of the total IQ scores of autistic children from specified subscales can help in a better understanding of cognitive abilities in difficult cases where performing a full IQ test is challenging.
- The significant dimensions of verbal and non-verbal IQ identified in this study can be used to evaluate difficult cases.

**Introduction**
Autism spectrum disorders (ASD) are characterized by deficits in social communication and social interaction and restricted, repetitive patterns of behaviour, interests, or activities.\(^1\) Expansion in understanding, awareness and recognition of autism spectrum disorder played a major role in increasing ASD prevalence globally as median global estimates in 2012 were about 62/10 000 according to review articles.\(^2\) The recalculated analysis of the Center for Disease Control in the US estimated prevalence of 240 per 10,000 in 2018.\(^3\) There is also increasing recognition of children with ASD in developing countries, but the prevalence rate has generally been noted to be lower than those observed in the industrialized countries.\(^4\) This has been attributed to cross-cultural variations in the presentation of ASD and as well as lack of registry and services for children with ASD.\(^5\) A recent study suggests that the prevalence of ASD among Omani children (0–14) who fulfilled DSM-5 criteria jumped to 20.4 per 10,000 in 2018 while it was 1.4 per 10,000 in 2011.\(^6\)

Intelligence has been perceived as a stable measure among the general population.\(^7\) However, the picture is not that clear when autism phenotype embedded in the picture where the notion
of intellectual quotient (IQ) stability is still under discussion. For instance, on one hand, some authors postulated that intellectual abilities in children with autism are stable over time mirroring the general population studies.\textsuperscript{8,9} While on the other hand, others documented improvement in IQ of autistic children and linked that to improvement in autism symptoms.\textsuperscript{10,11} The above discrepancy can be partially explained by the notion that subtests and index scores of IQ in autistic children are driven from measures which are basically representing characteristic strengths and weaknesses in autism phenotypic features.\textsuperscript{12,13}

On another scale, intellectual abilities showed variability in relation to autism symptomatology across different IQ assessment tools. This was further demonstrated by the better performance of autistic patients on the Raven Progressive Matrices, a well-established tool assessing complex reasoning, than on the Wechsler scales.\textsuperscript{14} Furthermore, autistic patients had better performance in Leiter International Performance Scale when compared to Stanford Binet Intelligence Scales-5th edition.\textsuperscript{15} With such discussion, characterization of subscales in intellectual function has been indicated to overcome the existing constraints and to add to the body of knowledge. Moreover, quantification of intellectual functioning has the potential to define the direction for intervention, remedial and rehabilitation in addition to the administrative decision and professional communication.\textsuperscript{16}

There are a plethora of studies examining the most suitable instrument in assessing the intellectual capacity in ASD.\textsuperscript{13} As yet, it appears that \textit{Wechsler Intelligence Scales} (WISC) and \textit{Stanford Binet} have borne out the most empirical support.\textsuperscript{17} There is a dearth of documentation on how the children with ASD in societies in transition such as those in Oman fare in such intellectual measures.

While the importance of quantifying intellectual functioning among ASD has been increasingly gained ground,\textsuperscript{18} to our knowledge, there are no studies in the Arab-Islamic countries that have reported the profile of intellectual functioning in children with ASD with a few exceptions.\textsuperscript{19} To fill the gap in the literature, this study deciphers the profile of children in Oman with ASD using \textit{Stanford Binet}. To lay the ground for their remedial and education intervention, it would be essential to tease out the performance of such a paediatric population on indices of intellectual functioning using \textit{Stanford Binet}.\textsuperscript{20} A related aim of this study is to explore the profile of autistic children on the Stanford Binet fifth edition scale and to attempt a prediction of the total IQ from most important subscales which carry the highest
variability. The prediction of the total IQ from subscales can help in better understanding of cognitive abilities in difficult cases were performing full IQ test is challenging.

Methods
Oman’s national health care service is free for its nationals. Tertiary care is largely compartmentalized and centralized in Oman. The first point of contact for most children with special needs and talent is primary health care centres or educational setting settings. The children with special needs and talent thereafter are referred to relevant services in tertiary hospitals. The present cohort was retrospectively extracted from Sultan Qaboos University Hospital, Department of Child Health, Developmental Paediatric clinic. Participants in the present study consisted of consecutive patients who were either following up or were referred for such services. The inclusion criteria consisted of subjects whose diagnostic and clinical observations indicated the presence of ASD as detailed below.

Clinical and demographic information was collected from patients' hospital medical records. Participant exclusion criteria included participants who are blind, deaf or otherwise seriously impaired by sensory or motor disorders that will render inaccessible for protracted evaluation of intellectual functioning. Omani children with autism spectrum disorder who aged between 3 and 13 years were identified as eligible participants for this study from the hospital registry at the Developmental Clinic, Sultan Qaboos University Hospital (SQUH). The study period was between June 2016 and June 2019. During that period there were 334 cases diagnosed as autism spectrum disorder utilizing gold standard methods in the developmental clinic, SQUH. Convenient sampling method was employed to select cases who fulfil inclusion criteria. A total of 100 children (79 were males and 21) identified to participate in this study. The adequacy of the sample of 100 children for evaluating the IQ profile of children with ASD was examined by statistical power analysis. Generally, “power” refers to the number of observations required to avoid a type II error in testing hypothesis. The power analysis of the sample of 100 children indicates that it would provide a power of 0.91 for estimating the IQ of ASD children within a five unit of the population value with 95% confidence level.

Autism spectrum disorder was diagnosed based on DSM-V criteria which were ensured by clinical history from parents, direct clinical observations of the children and a review of prior evaluations and record of early intervention if any. The assessment of ASD was conducted by a multidisciplinary team which consists of a psychologist, occupational therapist, speech
therapist, paediatricians, social worker and headed by an experienced developmental paediatrician who is well versed in diagnosis ASD using DSM V criteria.¹

Stanford-Binet Intelligence Scales-Fifth Edition (SB5) was used to measure the participant’s intellectual ability. SB5 taps into five weighted factors - verbal and nonverbal subtests. The five factors were tested: knowledge, quantitative reasoning, visual-spatial processing, working memory, and fluid reasoning. In this study, we have considered five cognitive profile groups such as ‘average and above level of IQ’ (IQ= 90 - 129), ‘low average level of IQ’ (IQ=80-89), ‘borderline impaired level of IQ’ (IQ=70-79), ‘mildly impaired level of IQ’ (IQ=55-69), and ‘moderately impaired level of IQ’ (IQ=40-54). We combined superior (IQ 120-129) and higher average (IQ 110-119) categories of IQ into one category of average and above because in our sample a very small number of children had superior and higher average IQ levels giving the categories very low statistical power for analysis.

This study was ethically approved by the Medical Research and Ethics Committee at Sultan Qaboos University. This study adheres to the World Medical Association’s Declaration of Helsinki (1964-2008) for ethical human research regarding participant’s confidentiality, privacy, and management of the data.

The study considered IQ levels (measured in full scale) as the outcome variable, and the demographic characteristics (such as age and gender) and the subscales of both verbal and nonverbal IQ as the explanatory or predictor variables. Both descriptive and inferential statistical techniques were used for data analysis. Frequency distribution was used to describe the demographics and IQ profiles of the selected sample of children with ASD. One-way analysis of variance (ANOVA) and correlation analysis was done to examine the statistically significant relationship between full-scale IQ and background characteristics. A p-value of <0.05 was considered statistically significant.

Multivariate statistical analyses using generalized linear model (GLM) approach were carried out to ascertain the significant predictors of the intellectual ability of the children with ASD. It is worth mentioning here that our response variable (full-scale IQ score) is a count variable with over-dispersion (variance=326.51 > mean=68.58) and a skewed distribution (skewness=0.745), which is the usual characteristic of count variables. Verbal and nonverbal IQ and all the IQ subscales are also count variable measured in interval scale.
As such count variable violates the basic assumptions of continuity, normality and homoscedasticity of Ordinary Least Square (OLS) regression technique and the standard test statistics for testing hypothesis such as the t-test.\textsuperscript{21} For modelling count data, Poisson regression is a natural choice. However, the most serious limitation of Poisson regression is that it assumes that the variance of the distribution of the count response variable is equal to its mean which is usually termed as equidispersion property. However, our response variable is over-dispersed. For the over-dispersed count variable, Negative Binomial (NB) regression is one of the alternative models to be used.\textsuperscript{22,23} Thus, in this study, we employed an NB regression model with a log link function for estimating the regression coefficients ($\hat{\beta}$).

For the convenience of interpreting the estimated coefficients, we have calculated the incident rate ratio (IRR) by exponentiating the beta coefficient, i.e., $\text{IRR}=\exp(\hat{\beta})$ for each category of the predictors The 95% confidence intervals (95% CI) of IRR also provided. The statistical software packages SPSS 25 was used for all statistical analysis. To test the internal consistency and reliability of the IQ measurement scales, Cronbach index was used.\textsuperscript{24} A high value of alpha=0.91 indicates an adequate level of reliability of the measurements. Given that the observed total IQ scores and its verbal and non-verbal subscales scores were obtained through a counting process, we employed the Poisson rate test for testing hypothesis regarding mean or difference between two means, instead of standard t-test.\textsuperscript{25} In fact, the Poisson rate is nothing but the mean of the distribution. Statistical package MINITAB has the option for the Poisson rate test.

Results
Table 1 presents the distribution of children with ASD according to their gender, age, and IQ classification profiles. Of the total 100 participating children in this study, 79 (79%) were males, and 21 (21%) were females. The age of the children ranges between 3 and 13 with a mean age of 7.1±2.5) years. Two-third (75%) of the participating children were aged 6-13 years. Both male and female children had a similar age distribution.

In terms of the performance of full-scale IQ measures, the mean IQ level among children with ASD was 68.6±18.1), ranging between 40 and 129. According to the five cognitive profile groups considered in this study, more than half (61%) of the children were found to
have mild to moderate impairment in IQ level (IQ score less than 70), while 16% were found to have average and above the level of IQ (IQ score ranging 90-129), and 14% had a borderline impaired or delayed level of IQ (IQ score 70 – 79). The distribution of IQ, as previously mentioned, was found to be positively skewed with skewness 0.745. The value of skewness indicates that the full-scale IQ was moderately skewed. The mean of non-verbal IQ was found to be 73.5±17.5, while for verbal scale IQ was 65.5±17.6 (Table 1).

The level of full-scale IQ varies with age, but the differences were not statistically significant. IQ level showed a U-shape pattern with age. Younger children under age six years tend to have a higher average IQ score than their older counterparts. The non-verbal and verbal IQ also showed a similar pattern of distributions with age. However, the relation was found statistically significant in the case of verbal IQ (Table 1).

Female children with ASD were found to have a slightly higher average IQ level (69.7±18.5) than their male counterparts (68.3±18.0). This is also true for verbal and non-verbal IQ level. However, the male-female differences in IQ levels were found to be statistically insignificant (Table 1).

To examine further the association between age and gender with IQ profile groups, Chi-square analysis was done. The results presented in Figure 1 showed no significant association between age and cognitive groups ($\chi^2$=10.467, $P=0.234$) (Figure 1). However, it was found that there were more younger children (age group 3-5 and 6-8 years) in the mildly impaired as well as in the borderline impaired groups, while there were more older children (age group 9-13 years) in the moderately impaired and low average groups. Younger children were more likely to have an average and above level of IQ than their older counterparts. The gender of the children also showed no significant association with cognitive groups ($\chi^2$=4.639, $P=0.326$) (Figure 2). However, male children were found to be more likely to be mildly impaired or borderline impaired than the female children, while females were often in a low average cognitive group than males (23.8% vs 5.1%).

Overall, the mean IQ for non-verbal scales was found to be significantly higher than that of verbal IQ ($Z=6.85$, $P<0.001$) (Table 2). However, all the components or subscales of non-verbal IQ were not higher than the corresponding components or subscales of verbal IQ. Among the five subscales of both verbal and non-verbal IQ, the mean of ‘verbal knowledge’
and ‘verbal quantitative reasoning’ were found to be higher than that of non-verbal, but the differences were not statistically significant. On the other hand, non-verbal ‘fluid reasoning (FR), ‘visual-spatial processing (VSP)’ and ‘working memory (WM)’ were found to be significantly higher than those of verbal subscales.

To evaluate the predictive validity of verbal and nonverbal subscales scores in explaining IQ performance of children with ASD, correlation analysis followed by regression analyses were performed. Table 3 presents the zero-order correlation coefficients between full-scale IQ scores and the ten verbal and nonverbal subscales scores as well as the inter-correlation among the 10 subscales scores. The significance tests of the estimated correlation coefficients were also done. The results indicate that all the correlation coefficients were found positive and significant at $p < 0.001$ level. Full-scale IQ scores have a strong correlation with the ten subscales scores, ranging $r=0.709$ to $r=0.853$. The amount of total variation (measured by $r^2$) in IQ level explained by the subscales ranged from 50% to 73%. This indicates that both verbal and nonverbal subscales are important in predicting overall IQ level and there is a significant linear relationship between IQ level and the subscales levels.

To identify the verbal and non-verbal subclasses that have significant predictive power in explaining the overall IQ level, the regression technique was employed. After checking the assumptions of linearity, multicollinearity, and homoscedasticity of the predictor variables, a generalized linear regression model with Negative Binomial log link was fitted with IQ level as the outcome variable and the verbal and nonverbal subscales as well as age and gender of children with ASD as the predictors. The results of the standardized residual analysis indicate that the assumption of linearity and homoscedasticity has been met. Although there were moderate to a strong correlation between predictors, the low VIF (variance inflation factors) (<5) indicate that multicollinearity was not an issue. The resulting model could describe 92% of the variability in total IQ by the predictors considered in the model, as the adjusted $R^2$ was observed to be 0.92. The likelihood ratio chi-square value of 356.5 with 12 degrees of freedom and p-value <0.001 indicates that the model significantly improved the prediction of total IQ. Table 4 presents the results of the regression analysis. The results indicate that non-verbal fluid reasoning, non-verbal visual-spatial processing, non-verbal working memory and verbal knowledge are the significant predictors of total IQ.
The level of IQ is likely to be increased by 1.3% with the one unit increase in non-verbal fluid reasoning (IRR=1.013, 95% CI: 1.002, 1.023, p =0.020). Similarly, one unit increase in the non-verbal visual-spatial processing increased the IQ level by 1.5% (IRR=1.015, 95% CI: 1.003, 1.025, p=0.012). Among the five verbal subscales, only verbal knowledge appeared as a significant predictor of IQ level. However, non-verbal quantitative reasoning and verbal quantitative reasoning appeared as marginally significant (0.05 < p < 0.10) predictors of IQ level. Gender and age of the children with ASD did not show any significant effect on IQ level.

**Discussion**

This is a cross-sectional study on children with ASD to explore their intellectual profile with age and gender differentials and to identify a shorter battery of the verbal and nonverbal subscales that predict the full-scale IQ of children with ASD. Among the participants of this study, 79% were male, resulting in a male: female ratio of 4:1, which is in line with the global scenario of the gender distribution of ASD with more male than female. Half of the cases of this study were between the ages of 6 and 8 years. The mean IQ of the autistic children in our sample was observed to be 68.58±18.07. This is comparable to the total IQ which was found to be 70.4 by Roid (2003) in the validity of Stanford-Binet Intelligence Scales-Fifth Edition study. Moreover, Charman and colleagues found that the mean IQ of the samples from a special needs and autism project in the United Kingdom to be 69.4 ± 24.1. The mean of non-verbal and verbal IQ was found to be 73.5± 17.5 and 65.5±17.6, respectively. This indicates that the non-verbal subscales outnumbered their verbal counterparts, which is also documented in other studies.

Our findings revealed that more than half (61%) of the participating children with ASD fulfil the classification of ‘mild to moderate’ impairment. This finding differs from those found in the UK dataset or the CDC surveillance data set in which they found that more than a quarter of participants with ASD have average or above-average IQs. This could be attributed to the severity of cases at detection point, explicitly, in our settings of underdiagnosis, the more severe cases tend to be diagnosed more than mild cases which can be melting in mainstream schools and misclassified as intellectual disability or other learning disabilities.

Male profiles were not significantly different from females neither in our cohort nor in the Canadian children with ASD. This can be attributed to the proximity of age groups as the
mean age was 7.07±2.50 years which was similar among males and females. After controlling the effect of age and gender, regression analysis identified a shorter number of verbal and non-verbal subscales as significant predictors of full-scale IQ. Interestingly, among the ten subscales, non-verbal fluid reasoning (NVFR), non-verbal visual-spatial processing (NVVSP), non-verbal working memory (NVWM) and verbal knowledge (VK) were noted to be in this study to be significant predictors of total IQ. Children with ASD scored the highest in the non-verbal visual-spatial processing (NVVSP), with mean scores of 7.36±3.625, while the lowest scores were on verbal fluid reasoning with mean scores of 3.87±3.395. In line with this finding, Matthews et al. found in their study that Verbal Fluid Reasoning (VFR) scores were low and Non-Verbal Visual-Spatial Processing (NVVSP) scores were comparable to our cohort with a mean of 7.27±SD 4.28.32 In general, intellectual profiles were found to be constant between high and low IQ groups across many studies as it essentially reflects the influence of autism on psychometric assessment.33,34 The predictability of non-verbal fluid reasoning, non-verbal visual-spatial processing, non-verbal working memory and verbal knowledge of the total IQ went up to 92%, thereby indicating their helpfulness in assessing difficult autistic children.

Nevertheless, we found high calculated power and predictability of certain subscales to IQ of autistic children, the fact that this is a single-centre study is considered a limitation. Undoubtedly, the findings of this study can pave the road for further testing of variables predicting IQ in autistic children in future research.

**Conclusion**

To our knowledge, this is the first study to examine intelligence profiles and its verbal and non-verbal predictors among children diagnosed with an autism spectrum disorder in Oman. The present study suggests no difference in IQ between males and females with non-verbal IQ is significantly higher than verbal IQ across both genders. The most important determinants of total IQ, achievement among variable subscales are non-verbal fluid reasoning, non-verbal visual-spatial processing, non-verbal working memory and verbal knowledge. These variables can indeed assist as reliable dimensions in evaluating IQ, defining the direction for intervention and professional communication.

**Conflict of Interest**

The authors declare no conflicts of interest.
Funding
No funding was received for this study.

References
10. Sigman M, McGovern CW. Improvement in cognitive and language skills from


https://doi.org/10.1007/s10803-014-2200-0


**Table 1**: Mean ±SD of full-scale IQ, nonverbal IQ and verbal IQ by age and gender, Oman 2020

<table>
<thead>
<tr>
<th></th>
<th>Full scale IQ</th>
<th>Nonverbal IQ</th>
<th>Verbal IQ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F, P-value</td>
<td>Mean (SD)</td>
<td>F, P-value</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>1.40, 0.251</td>
<td>79.2±17.3</td>
<td>3.62, 0.031</td>
</tr>
<tr>
<td></td>
<td>(65.1 - 81.5)</td>
<td>(72.4 – 85.9)</td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>0.01, 0.932</td>
<td>71.5±16.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(61.4 – 70.5)</td>
<td>(65.0 – 77.9)</td>
<td></td>
</tr>
<tr>
<td>9-13</td>
<td>0.11, 0.748</td>
<td>72.0±19.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(60.9 – 77.4)</td>
<td>(64.4 – 79.5)</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>68.3±18.1</td>
<td>73.6±17.6</td>
<td>64.8±17.6</td>
</tr>
<tr>
<td></td>
<td>(61.2 – 75.4)</td>
<td>(66.7 – 80.5)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>69.7±18.5</td>
<td>73.2±17.9</td>
<td>67.8±17.8</td>
</tr>
<tr>
<td></td>
<td>(62.4 – 76.9)</td>
<td>(66.1 – 80.2)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68.6±18.1</td>
<td>73.5±17.5</td>
<td>65.5±17.6</td>
</tr>
<tr>
<td></td>
<td>(65.0 – 72.2)</td>
<td>(70.1 – 77.0)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1: Percentage distribution of children according to IQ profile groups and age, Oman 2020

\[ \chi^2 = 10.467, P = 0.234 \]

Figure 2: Percentage distribution of children according to IQ profile groups and gender, Oman 2020

\[ \chi^2 = 4.639, P = 0.326 \]

Table 2: Mean±SD of verbal and non-verbal IQ subscales before, and statistical significant test of difference between means of verbal and non-verbal subscales, Oman 2020
**Table 3:** Zero-Order Correlations between total IQ and IQ subscales, Oman 2020

<table>
<thead>
<tr>
<th>IQ subscales</th>
<th>Verbal Mean±SD</th>
<th>Non-verbal Mean (SD)</th>
<th>Z*</th>
<th>P-value</th>
<th>95% CI for difference of mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid reasoning</td>
<td>3.87±3.39</td>
<td>5.93±3.66</td>
<td>6.58</td>
<td>&lt;0.001</td>
<td>(1.45, 2.67)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>5.34±3.46</td>
<td>5.16±3.24</td>
<td>0.56</td>
<td>0.579</td>
<td>(-0.81, 0.45)</td>
</tr>
<tr>
<td>Quantitative reasoning</td>
<td>4.79±3.55</td>
<td>4.66±3.46</td>
<td>0.42</td>
<td>0.672</td>
<td>(-0.73, 0.47)</td>
</tr>
<tr>
<td>Visual spatial processing</td>
<td>3.91±3.59</td>
<td>7.36±3.62</td>
<td>10.28</td>
<td>&lt;0.001</td>
<td>(2.79, 4.11)</td>
</tr>
<tr>
<td>Working memory</td>
<td>3.99±2.82</td>
<td>5.29±3.42</td>
<td>4.27</td>
<td>&lt;0.001</td>
<td>(0.70, 1.89)</td>
</tr>
<tr>
<td>Total IQ</td>
<td>65.46±17.60</td>
<td>73.53±17.54</td>
<td>6.85</td>
<td>&lt;0.001</td>
<td>(5.76, 10.38)</td>
</tr>
</tbody>
</table>

*Z indicates Poisson rate test for count data

**Table 4:** Negative Binomial regression analysis of the intellectual quotient among children with Autism Spectrum Disorders, Oman, 2020

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Incident rate ratio (IRR)</th>
<th>95% CI of IRR</th>
<th>P-value</th>
<th>Collinearity statistics: VIF†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>39.145</td>
<td>34.139 - 44.885</td>
<td>&lt;0.001</td>
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<td>Gender (Female)</td>
<td>1.013</td>
<td>0.953 - 1.077</td>
<td>0.682</td>
<td>1.803</td>
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<tr>
<td>age</td>
<td>1.008</td>
<td>0.995 - 1.021</td>
<td>0.223</td>
<td>1.096</td>
</tr>
<tr>
<td>Non-verbal Fluid Reasoning</td>
<td>1.013</td>
<td>1.002 - 1.023</td>
<td>0.020</td>
<td>2.870</td>
</tr>
<tr>
<td>Non-verbal Knowledge</td>
<td>1.008</td>
<td>0.995 - 1.022</td>
<td>0.207</td>
<td>3.255</td>
</tr>
<tr>
<td>Non-verbal Quantitative Reasoning</td>
<td>1.011</td>
<td>0.999 - 1.024</td>
<td>0.083</td>
<td>3.706</td>
</tr>
<tr>
<td>Non-verbal Visual Spatial Processing</td>
<td>1.015</td>
<td>1.003 - 1.025</td>
<td>0.012</td>
<td>2.143</td>
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<tr>
<td></td>
<td>1.011</td>
<td>1.001</td>
<td>1.022</td>
<td>0.038</td>
</tr>
<tr>
<td>-----------------------------</td>
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<tr>
<td>Non-verbal Working Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Fluid Reasoning</td>
<td>0.996</td>
<td>0.984</td>
<td>1.008</td>
<td>0.517</td>
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<tr>
<td>Verbal Knowledge</td>
<td>1.012</td>
<td>1.009</td>
<td>1.028</td>
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<tr>
<td>Verbal Quantitative Reasoning</td>
<td>1.010</td>
<td>0.999</td>
<td>1.021</td>
<td>0.088</td>
</tr>
<tr>
<td>Verbal Visual Spatial Processing</td>
<td>1.005</td>
<td>0.994</td>
<td>1.017</td>
<td>0.371</td>
</tr>
<tr>
<td>Verbal Working Memory</td>
<td>1.008</td>
<td>0.995</td>
<td>1.022</td>
<td>0.208</td>
</tr>
</tbody>
</table>

†VIF: Variance Inflation Factor