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Statistical Support for QuickScreen Dyslexia Test Diagnostic Accuracy Assessments 2020-21

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Executive Summary

Background

QuickScreen is an adult computerised screening test that assesses and delivers an indication of possible dyslexia without the need for users to undergo a costly professional assessment by an educational or occupational psychologist. In this study, Select provided an independent analysis of the diagnostic accuracy of QuickScreen based on the test's dyslexia quotient (degree of consistency with a dyslexia profile, based on established research). The data were provided by Pico Educational Systems and included all candidates who, between mid-December 2020 and January 2021, undertook a test via their university, college or workplace assessment process, along with members of the public who requested access to the test via the website. Therefore, the results reflect a cross-section of the public who accessed the service within this period, consistent with the normal age range of the test (17-55+). Participants with a previous positive assessment for dyslexia were considered in the dyslexic group for analysis. The non-dyslexic group included those without a previous assessment and who reported no life-long difficulties with literacy. A separate control group of non-dyslexics was also included, comprising self-selected volunteers without dyslexia. Candidates without a previous assessment but who reported life-long difficulties with literacy were considered "at risk" and explored in a separate exploratory analysis in the dyslexic group. Note: All participants' data was anonymised by Pico Educational Systems Ltd prior to being provided to Select for analysis and was handled in accordance with their current privacy policy.

Headline Results

An essential step in the evaluation process of any diagnostic/screening test is to assess its accuracy. The overall accuracy of a diagnostic test indicates how good it is at correctly identifying people with and without the condition in question. It is the probability that someone's status is correctly identified by the test. Based on the full sample of data for the dyslexic and non-dyslexic groups and to maximise the overall accuracy of the test, participants with a quotient greater than 4.25 (or equivalently a dyslexia percentile > 0.40) should be considered test positive (indicated to have dyslexia) and those ≤ 4.25 test negative (indicated to not have dyslexia). This cut-off aims to identify the quotient figure between the possible existence of dyslexia and a lack of symptoms, as a dyslexia screener. Based on this threshold, and assuming an estimated prevalence of dyslexia in the population of 10% (i.e., reflecting the results that we might expect if the test were applied to a random sample of the population), the QuickScreen test was estimated to have a high overall accuracy rate of 93% (95% confidence interval [CI]: 89 to 96%, reflecting sampling variability). The Receiver Operating Characteristic (ROC) area under the curve (AUC) was estimated to be 97% (95% CI: 95 to 99%). Given that the AUC represents the discrimination of the test where 100% is the best possible value (perfect classification), this illustrates that the QuickScreen test has strong predictive capacity for dyslexia.

We also analysed the link between speed of processing and dyslexia (a finding of a previous study), to further explore the extent to which slow processing might be an aggravating symptom for dyslexia and recognising the relevance of fast/efficient processing skills in high achievers. There was a statistically significant association between the QuickScreen general speed of processing result (Difficulties/Average/No Difficulties) and the non-dyslexic/dyslexic group; along with evidence of a better average speed of processing score for the non-dyslexics versus dyslexic participants. Therefore, speed of processing may be useful in identifying potential difficulties in learning profiles, as a standalone characteristic. Additionally, we found a statistically significant association between the speed of processing results and severity of dyslexia, measured as the dyslexia quotient minus the processing speed disparity factor, i.e., removing the speed of processing contribution from the quotient. For both dyslexics and non-dyslexics, participants with a worse speed of processing score tended to have a higher adjusted dyslexia quotient. A higher adjusted quotient was also observed on average for those with difficulties, followed by the average group, and then no difficulties with speed of processing. So, for participants in the dyslexic group, those with worse speed of processing results are associated with more severe dyslexia. Similarly, albeit at a lower level, for participants in the non-dyslexic group, those with worse speed of processing results are associated with more evidence of dyslexic symptoms (and equally those with better speed of processing results are associated with less of evidence of dyslexic symptoms).

Note: Slightly differing results for the quotient threshold and diagnostic accuracy measures are obtained if we alternatively choose the cut-off that maximises the sensitivity + specificity of the test, rather than the overall accuracy. There is a trade-off in the sensitivity vs specificity of the test for different thresholds which results in slight variation in the associated overall accuracy estimate. Furthermore, if we assume a higher prevalence of dyslexia, for example, that associated with those who might self-identify for a QuickScreen test (as opposed to the whole population), slightly differing estimates of the overall accuracy are obtained. These results are included in full in the body of this report.

Discussion/Context

The QuickScreen test results are almost entirely based on the candidates' current performance and a positive conclusion of Mild, Moderate or Strong indicators will have been adjusted in the light of attainment levels in verbal processing, literacy, and speed of processing. Whilst these can be seen as contributory elements, they are not necessarily the

determining factors of dyslexia, and most likely not so when occurring in isolation in an otherwise consistent set of high-performance results. Therefore, it is possible to have a low result on one or more of these components but not be dyslexic.

Likewise, degrees of compensation are also taken into consideration by the QuickScreen test and may positively influence a dyslexia indication by reducing it to a Mild, Borderline or even None category where these other attainment levels are found to be satisfactory. To that extent the test result is not a diagnosis, but it is designed to act as a 'functional dyslexia screener' that provides immediate and detailed insights into an individual's current learning profile and upon which individual support programmes can be devised, reasonable adjustments put in place at work and where possible additional time in written examinations be considered.

To access the full report please check the research section of the qsdyslexiatest.com website where it will be posted shortly.