The effects of environment on psychometric performance in Masvingo district of Masvingo province, Zimbabwe

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The study examined the effects of rural and urban orientations on pupils’ performance on WISC-R (a standardised intelligence test). The study made use of an experimental method. The data were collected on a sample of 100 primary school pupils (50 rural and 50 urban). The participants were from grade 5 and had an average age of 10 years. The independent variable was the environment in which the pupil was raised. The dependant variable was the performance of the pupils on the WISC-R intelligence test. The control group of the study was the rural pupils whilst the urban based pupils were the experimental group. Participants from the two backgrounds were each tested on WISC-R’s 10 subtests. The results showed a significant difference in performance on WISC-R between the two groups. The urban group scored in the superior range whilst the rural group scored in the lower range in all but one of the subtests.

Key words: Performance, environment, intelligence, rural areas, urban areas.

INTRODUCTION

Psychometrics involves the measurement of intelligence, personality, attitudes, aptitudes and interests (Anastasi, 1988). A standardized instrument is recommended when measuring these attributes. Psychometric testing in particular, intelligence testing is very crucial in schools. It is useful for screening purposes, identification of gifted children, identifying learning or teaching problems and hence to facilitate intervention in the form of remedial programmes, if need be.

Wechsler Intelligence Scale - Revised (WISC-R) is an example of a psychometric test that is widely used in Zimbabwean schools by psychologists to determine appropriate placement of pupils. WISC-R provides a measure of general intellectual functioning. It consists of a verbal scale and a performance scale. The verbal scale measures information, similarities, arithmetic, vocabulary and comprehension while the performance scale consists of picture completion, picture arrangement, block design, object assembly and coding. Results from the verbal and performance scale give a full scale Intelligence Quotient (IQ) (Simpson, et al 2002).

The same WISC-R tests are used in both rural and the urban schools in Zimbabwe. Masvingo district has both urban and rural set up. Rural areas in Zimbabwe are home to mainly small scale farmers with very low disposable income. The poverty, coupled with a poor or sometimes non-existent electricity network makes access to information in rural areas very difficult. However, the situation in urban areas is generally better as most pupils are exposed to media such as satellite television, magazines and the Internet as well as technological gadgets such as smart phones. It is against this background that the researcher intends to find out whether a learner’s environment has an effect on their psychometric performance.

Statement of the problem

Confirming the literature highlighted above, anecdotal evidence also suggests that school pupils living in the rural areas generally do not perform as well as their peers living in urban areas in psychometric tests. The current study, therefore seeks to investigate whether a pupil’s environment has an effect on their performance in the WISC-R intelligence test.

Hypothesis

Null hypothesis: There is no difference in performance in psychometric tests between rural and urban pupils.
**Alternate hypothesis:** Pupils in urban areas perform better in psychometric tests than pupils in the rural areas.

**RESEARCH DESIGN**

The current study used the experimental design. The choice to use this design was necessitated by the fact that the experimental design is the only means by which cause and effect can be established. The experimental method consists of standardised procedures and measures which allow it to be easily replicated (Leedy and Ormrod, 2005). The more often an experiment is repeated with the same results obtained, the more confident we can be that the theory being tested is valid.

**Variables**

The study sought to investigate the effects of environment on psychometric performance in primary school pupils. The independent variable was the environment in which the pupil was raised. In this case it had two levels, urban and rural. The dependent variable was performance of pupils in the WISC-R intelligence test. The control group of the study was the rural pupils while the urban based pupils constituted the experimental group. It was assumed that the urban group, by virtue of their upbringing, was the group with the treatment i.e. exposure to information and technology, while the rural group was the group with no or little treatment i.e. lack of access to information.

**Population**

All grade five pupils in Masvingo district constituted the study’s population.

**Sample**

The sample for the present study was 100 primary school pupils. Out of these, 50 were drawn from rural areas and 50 were from the urban. These participants were drawn from grade 5 and were aged between 10 years and 10 and half years. Stratified random sampling procedure was used to come up with the sample.

**Instrumentation**

WISC-R, a form of a standardised test was the instrument for data collection. Each participant was tested on verbal and performance abilities. The verbal scale measures information, similarities, arithmetic, vocabulary and comprehension. Information measures one’s range of knowledge of the world around him. Similarities measures abstract thinking whilst arithmetic focuses on concentration, motivation and memory. Vocabulary can be used to evaluate baseline intelligence. It measures the child’s ability to define words. The comprehension subtest measures common sense and judgement.

The performance scale measures picture completion, picture arrangement, block design, object assembly and coding. Picture completion entails alertness to detail while picture arrangement tests planning abilities. Block design assesses nonverbal reasoning. Object assembly focuses on analysis of part-whole relationships. Coding is centred on visual-motor functioning. The verbal and performance scale scores were added to come up the individual’s full scale IQ.

**Data collection procedure**

Participation in the research was voluntary. WISC-R was administered in English by the researcher, a trainee educational psychologist. The intelligence test was administered individually with all the participants given equal time to complete the subtests. Following the administration procedures in the WISC-R manual (1976), the researcher was alternating performance and verbal scales for each test taker. This was done to make the testing session more interesting and varied. Information and picture completion are placed at the beginning of the sequence because; they are usually good “icebreakers”, not too taxing on the child.

**RESULTS PRESENTATION AND DISCUSSIONS**

The researcher made use of tables showing data that has been analysed using the Statistical Package for Social Sciences Version 16.0. The results and discussions are presented in the next sections.

**Comparisons of the two groups’ performance on specific WISC-R variables (subtests)**

Table 1 shows the means and the mean differences of scaled scores for the 100 participants on each of the 10 WISC-R subtests. A description of the discrepancies of the two groups in each of the ten subtests is also given.

**Information**

Results from the data analysis indicated that there was a significant difference between the two groups’ performances on the Information subtest. The rural group
had a mean of 1.92 and a standard deviation of 0.78. On the contrary, the urban group had a mean of 5.9 and a standard deviation of 2.18. The mean difference between these two groups on Information had a high value of 3.98. This difference can probably be explained by the differences in exposure to information between the two groups.

Urban pupils are far much better in comparison to their rural peers in terms of exposure to information. They have got access to libraries unlike those in the rural areas. This finding can be supported by the findings from a study by Amin (1999), who noted that schools located in urban areas in Cameroon tend to perform better than those schools located in the rural areas. The knowledge base of children from the rural areas is greatly restricted by their environment.

The WISC-R Information subset seeks to find out one’s range of knowledge of the world around him. Considering that the WISC-R intelligence test was designed using the Western norm group, Zimbabwean children in general and in particular those from rural areas are at a great disadvantage. This is so because what can be considered as general knowledge in the West might be something very difficult in the Zimbabwean context.

**Similarities**

The urban group performed significantly better than their rural counterparts on the Similarities subset (t = 6.771, p = 0.000). The group’s mean of 4.9 (SD = 1.73) was much higher than the rural pupils’ mean score of 2.94 (SD = 1.10).

The Similarities subset measures abstract thinking. Under this subset, an individual is expected to identify similarities between items in each pair.

The poor performance on this variable by the rural pupils can be attributed to differential familiarity with the test materials themselves. Serpell (1979) asked Zambian and English children to reproduce patterns in 3 media: wire models, clay models, or pencil and paper. The findings revealed that the Zambian children excelled in the wire medium with which they were familiar, while the English children were best with pencil and paper. Both groups performed equally well with clay.

Taking for example item 4 of WISC-R Similarities variable has got piano-guitar. Rather than concentrating on the similarities between these two items, a rural pupil might be at pains trying to figure out what a piano is. In this case, the failure to identify similarities can be attributed to unfamiliarity with the content of the test item.

**Arithmetic**

On the other hand, there was no statistically significant difference between the two groups’ performance on the Arithmetic variable (t = 1.099, p = 0.275). The rural group scored a mean of 4.98 with a standard deviation of 1.44, whilst, the urban group’s mean was 5.38 with a standard deviation of 2.14. The resultant mean difference between the two groups on this variable was very slight at 0.4. This finding concurred with Alspaugh (1992) who conceded that there were no differences in math achievement scores between the rural and urban schools.

The slight difference between the two groups is evidence enough that despite the different conditions in terms of exposure, rural pupils were equally good in comparison to the urban pupils on the subtest. The Arithmetic subtest measures a child’s ability to solve mathematical problems of addition, subtraction, multiplication and division.

The homogeneity of the two groups on the subtest may suggest that performance in arithmetic problems is immune to one’s environment. A typical rural learner using fruit seeds to add up two numbers is just as likely to get the same result as an urban counterpart using some fancy counting devices such as abacuses.

**Vocabulary**

On the Vocabulary subtest, the urban group scored in the superior range of 6.6 with a standard deviation of 2.41. On the other hand, the rural group scored in the low range with a mean of 2.14 and a standard deviation of 0.64. This subtest had the highest mean difference of 4.46 between the two groups and consequently resulted in a statistically significant discrepancy between the two groups (t = 12.661, p = 0.000).

Mercer (1987) postulated that in the Vocabulary subtest, the aim is to assess the child’s ability to define words. Table 1 shows a great difference between the two groups’ performance on this variable. It could have been difficult for rural pupils to define the given words as they may have been meeting them for the first time. In addition, the rural based pupil’s vocabulary is bound to be low given their social environment.

Barnett and Casper (2001) quoted in Wikipedia defined social environment as “the physical or social setting in which people live or in which something happens or develops”. They further stated that the social environment “… may be the culture that the individual was educated or lives in, or the people and institutions with whom they interact.” Thus the social environment has a significant effect on the overall development of a child. For example, Dube, (1982) reported that children in Botswana accustomed to storytelling have excellent memories for stories.

Likewise, children from urban areas did well on this variable mainly because of their access to media such as satellite televisions, newspapers and the internet, which assists them greatly in honing their vocabulary skills.
Comprehension

The results in Table 1 show that the urban pupils surpassed their rural counterparts’ performance on the Comprehension variable. This is supported by the evidence from the research where the rural pupils had a mean of 2.02 with a standard deviation of 0.85. On the other hand, the urban pupils had a mean of 5.5 with a standard deviation of 2.54. The mean difference between the two groups on the Comprehension variable was 3.48. This is an indicator that there was big difference between the two groups’ performance on the Comprehension subtest. This difference can be attributed to differences in exposure between the two groups and also to the levels of vocabulary exhibited by the two groups.

Baumann (2005) suggested that word knowledge has an irrefutable association with text comprehension. In other words, vocabulary knowledge is critical to understanding comprehension. Cunningham and Stanovich (2003) agreed with Baumann (2005) when they proclaimed that there is “a strong possibly reciprocal if not causal relationship among vocabulary, intelligence, comprehension and exposure to text through independent reading”.

The research results in Table 1 seem to support this theory. Urban pupils who had a high mean score on the vocabulary test also scored high marks in the comprehension subtest. Rural pupils whose vocabulary capabilities appeared to be lacking unsurprisingly also performed poorly on the comprehension subtest.

Picture completion

There was a significant difference between the two groups’ performance on this subtest, (t = 3.858, p = 0.000). The rural group had an average score of 2.8 with a standard deviation of 1.14. The urban group had a mean of 4.08 with a standard deviation of 2.05. Of note is that these two groups’ mean difference of 1.28 on the Picture Completion was slightly small compared to other subtests.

This variable measures alertness to detail. Instead of identifying the missing part of a given object rural children could have been concentrating on finding out what the object is since they might have been seeing it for the first time. Therefore, the rural pupils’ failure on this subtest could, more than anything, be linked to unfamiliarity to the given objects. Unlike the rural group, pupils from the urban areas performed fairly well as they might have had some exposure to the objects in the subtest.

Picture arrangement

This is another variable with a sizeable rural disadvantage. This is reinforced by the poor performance by rural pupils (M = 3.3, SD = 1.56) on this variable in relation to their urban peers (M = 5.78, SD = 2.10).

This variable measures planning, observing and nonverbal reasoning ability. In this subtest, the child has to rearrange jumbled up pictures to depict a meaningful story. For one to be able to complete the task, one needs to understand and decode the symbols on the pictures. In item 24 of the subtest, a telephone is presented without the cord connecting the receiver to the base of the telephone (WISC-R manual, 1976).

The probability is high that some of the rural pupils may have never encountered a telephone set before. Hence it becomes difficult, if not impossible for the child to recognize or pinpoint the missing part. The urban child, on the other hand, might have encountered a telephone set at school, in stores or even at home making the identification of the missing part a relatively easier task.

Block design

Though the rural group trailed behind their urban colleagues’ performance on this subtest, it appears the
performance gap is not very wide (Mean difference of 1.48). The rural group recorded a mean score of 3.16 with a standard deviation of 1.31. On the contrary, the urban group scored an average of 4.64 with a standard deviation of 1.61.

Dembo (1994) argued that in block design, a child is presented with sets of special blocks which might be red, white, green, and/or yellow. The child has to use these blocks to copy designs demonstrated by the examiner. The test progressed from simple designs and proceeded to more complex models. Hence the test requires a child to have skills of “nonverbal preservation of procedural data”, (Ottem, 1999).

Dirks (1982) investigated the extent to which 10-year old children's scores on the WISC-R Block Design subtest were affected by prior experience with a specific commercial game that involved blocks and matching patterns”. The results showed that “children who happened to have experience with the particular commercial game scored approximately three scaled score points higher on the WISC-R Block Design subtest than 24 matched children without game experience”. The overall performance of the children who had been exposed to the commercial game was significantly better than for the group with no prior exposure.

The results of the present study suggest a similar pattern of better performance by the urban group over the rural group on the Block Design subtest. Urban children, by virtue of their more privileged environment both at home and at school are more likely to have had some contact to a game akin to the block design test of WISC-R, and therefore performing better on the subtest than the rural children.

**Object assembly**

A significant difference between the two groups on the Object Assembly subtest (t = 5.898, p = 0.000) was obtained. The urban group had an average of 5.58 with a standard deviation of 1.98. In comparison, the rural group had an average of 3.5 with a standard deviation of 1.52. The two groups’ mean difference on the same subtest was 2.08.

This subset examines speed of mental processing and anticipation of relationships among parts. It closely resembles experience with puzzles. Magazines and weekly newspapers usually have children pages where puzzle like games such as Sudoku are displayed. While magazines and newspapers are common in the urban areas, the opposite is true for rural areas. Thus the only games that are available to a rural pupil are usually the traditional varieties such as “pada” and “nhodo” which are ‘free’ to use. Urban children who have access to the print media in their homes are exposed to and may play these games. This might explain their better performance on the Object Assembly subset.

**Coding**

The urban group continued with their dominance over the rural group in this subtest. They recorded a mean score of 4.38 with a standard deviation of 1.75, while the rural group could only manage a mean score of 3.14 with a standard deviation of 1.09. The mean difference between the two groups on this particular subset was not very high, (1.24).

This variable measures the ability to learn unfamiliar task, visual-motor dexterity, degree of persistence and speed of performance. The pupils from the two groups exhibited a strong capability to follow given instructions within the given time. Pupils from the rural areas showed flexibility and persistence in the given task and that earned them high marks. The urban group as usual performed in the superior range compared to their rural counterparts.

**Comparisons of the two groups’ verbal, performance and full scale IQ**

Table 2 shows that the urban pupils significantly outperformed the rural pupils on all the IQ scores and this might suggest an advantaged background and environment for them. The rural pupils seem to have little or no exposure to information that might help in performance in the IQ tests.

On the Verbal IQ, it is evident that the rural group was outclassed by the urban group. The urban group had a superior mean IQ score of 73.3 (standard deviation of 5.33) compared to a very low score of 54 (standard deviation of 3.8) for the rural group. A massive significant difference between the two groups on the Verbal IQ (t = 20.854, p = 0.000) at 0.05 significance level was thus obtained. These results suggest that urban pupils are endowed with verbal supremacy over their rural counterparts mainly because of their exposure to various channels of multimedia which are absent in the rural set up.

From the results, it is evident that the rural group’s performance on the Performance IQ (M = 56.3, SD = 5.94) at the 0.05 significance level was slightly greater than that of their Verbal IQ (M = 54, SD = 3.8) at 0.05 significance level. Ysseldyke (1995) posited that while all ethnic groups have the capacity to process information and think, it has been found that different cultures, having different environmental influence, value particular skills.

Some people in the rural areas define intelligence in terms of how one is able to perform given tasks that do not include verbal aspects for example climbing a very tall tree. This can explain why rural pupils did a little bit better on performance subset than on the verbal subtest. Conversely the urban group’s score on the Performance IQ (M = 66.78, SD = 5.28) was lower than their verbal performance (M=73.3, SD = 5.33). Because of their exposure to a media rich environment, people in the urban areas tend to value verbal skills as opposed to
performance based ones. However, the urban group's performance was still high enough to be statistically different (p < .05) from the rural group, (t = 9.33, p = 0.000).

Table 2 shows that the average Full Scale IQ of both the urban pupils and the rural pupils was below the expected standard average IQ score of 80. So even though the urban group’s performance on the test, (Mean = 68.2, SD = 4.17), was significantly better than that of the rural group (Mean = 51.08, SD 4.45), it was much lower than the expected performance given the children’s age.

Overall implications

The main aim of the study was to test whether there was any difference in performance between urban pupils and rural pupils in Masvingo district on the WISC-R intelligence test. Results have proved that there were significant differences in all but one subtest of the test with the urban group performing better in all the subtests that differed. The subtests in which the urban group was significantly better (p < .05) than the rural pupils are: Information, Similarities, Vocabulary, Comprehension, Picture Completion, Picture Arrangement, Block Design, Object Assembly and Coding. It is only in the Arithmetic subtest that the two groups’ performance proved homogeneous. Therefore, with the exception of the Arithmetic section, all the other subtests of the WISC-R intelligence test were culturally not fair. Urban pupils' better performance in the subtests was due to their multimedia rich environment that has exposed them to the Western culture for which the WISC-R intelligent test is most suited.

Not surprisingly, the urban group also scored significantly better results (p <.05) than the rural group on both the verbal IQ and performance IQ factors. Consequently the Full Scale IQ for the urban group was significantly superior to their rural counterparts. Thus the current study has provided data for the differences in performance between urban pupils and rural pupils in Masvingo district. In addition the relationship between the social and cultural environment and performance in the WISC-R intelligence test in the province was uncovered.

Differing social and cultural environments between the two groups gave rise to the differences in performance on the test. So it can be concluded that the variations found are more to do with the instrument itself and also differences in social and cultural environment and not the intelligence of the pupils.

Another critical finding of the study is the general depression of scores across all the ten subtests of the WISC-R test for both the urban and rural groups. Despite their superiority, the performance by the urban pupils is far below what is expected of their age group. So while they are better off than their rural peers results indicate that they also had difficulties with the test.

This may then give weight to the claim by Zindi (1994), that “Zimbabwean pupils especially those from the rural areas are not very familiar with psychometric testing”. In this regard, it can be argued that the urban group were able to “rehearse and master concepts and information as well as develop test-wiseness skills” (Nell, 1999) compared to their rural counterparts.

Conclusion

Results from the study revealed that there was a significant difference between the two groups with regards to their performance on WISC-R intelligence test. The analysis further showed that pupils from rural areas underperformed their urban counterparts in all the 10 subtests of WISC-R. Zhang (2006) argued that rural education in many developing countries is often synonymous with disadvantages for learning. This argument was supported by the current research findings which showed that rural pupils performed in the low range mainly because of lack of exposure.

It has been shown that environment plays a significant role in children’s performances. The environment rich in human and material resources (urban) appeared to offer a favourable condition for learning and hence pupils from such an environment did well on the WISC-R intelligence test. The rural areas on the other hand offered some restrictions in terms of lack of exposure to information and technology.

Of importance here is to note that two groups (urban and rural) appeared to have a number of challenges with
regards all the 10 subtests that were administered to them. This can be attributed more to the origin of the test than anything else. The WISC-R was standardised using the Western norm group. This makes it culturally unfair to use this test on a Zimbabwean child worse still those in the rural areas. In this regard it becomes very difficult to conclude that the differences are due to the pupils’ real IQs or to other factors like test validity and reliability.

**Recommendations**

After carrying out the study on the effects of environment on psychometric performance in Masvingo district of Masvingo province in Zimbabwe, the researcher has got the following recommendations to make:

1. The Zimbabwean psychologists should expedite the move to develop instruments which are locally standardized. This is especially important considering that all the psychometric assessment tools currently in use in Zimbabwe were standardized using the Western norm group. Worth noting is that the Zimbabwean and the Western norms are miles apart hence the need for a friendly and culture fair test.

2. Public policy makers should ensure equitable distribution of human and material resources in all the schools in rural and urban areas. This recommendation can be supported by Kling et al. (2007) who advocated for the spreading of the availability of schooling and learning facilities to all. It is encouraged that all schools be equipped with top of the range equipment in line with technological advancement. Also, there should be equitable distribution of qualified and unqualified teachers in both urban and rural areas.

3. Results from the study also suggest that it is crucial to improve the school processes and strengthen home support for children in order to improve the literacy rate for both rural and urban pupils.

4. It is recommended that schools both from rural and urban areas should help pupils to develop test-taking skills.

**REFERENCES**


