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Norms for the Standard Progressive Matrices in the Gaza Strip

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The Standard Progressive Matrices (SPM) was standardized in the Gaza Strip in 2012-13 on a sample of 1677 boys and 1818 girls aged 8 to 18 years. The sample obtained a British IQ of 67.9. The result is discussed in the context of living conditions in Gaza.

Key words: Gaza Strip, Palestine, Standard Progressive Matrices, intelligence.

A research program to collect IQs for all nations in the world was initiated by Lynn (1978) and has been extended in a number of subsequent publications summarized by Lynn and Vanhanen (2012). In these studies, average national IQs are calculated in relation to a British mean of 100 and standard deviation of 15 and are designated "British IQ" or "Greenwich IQ". National IQs are significantly associated with a number of country-level social and economic indicators including educational attainment, per capita income, infant mortality and democratic institutions (Lynn and Vanhanen, 2012).

The Gaza Strip, with a population of approximately 1.85 million in 2015 that is growing by 3.4% per year, is an especially interesting case. Most residents of the territory are descended from approximately 250,000 refugees who were expelled from their homes in the Israeli territories in 1948. The Gaza Strip was occupied by Israel in 1967, which was followed by increasingly severe restrictions on the movement of people and goods. Since 1991, residents were not allowed to leave Gaza to travel to Israel or the West Bank without a special exit permit

from the Israeli authorities, and borders were closed comprehensively in 2000. The movement of people and goods across the border was halted at that time resulting in a downward spiral of the Gazan economy. After the Israeli retreat in 2005, international economic sanctions began in 2006 followed by a comprehensive blockade in 2007 that is still in effect today (Filiu, 2014).

Widespread poverty and unemployment were the predictable results (Etkes and Zimring, 2015; Strand, 2014). The situation has been aggravated by periodic military incursions since 2006 that destroyed much of the infrastructure, with equally predictable effects on the people of Gaza (Manduca et al., 2014). According to the CIA's World Fact Book (https://www.cia.gov/library/publications/the-world-factbook/geos/gz.html) the most recent incursion, in 2014, destroyed 20% of the territory's remaining industrial capacity, displaced more than 100,000 people and left 30% of households without potable water. Conditions are such that some analysts describe Gaza as the world's biggest prison (Marshall, 2014). Today the population depends on humanitarian assistance, primarily from the United Nations. Thus Gaza offers an interesting case study of a population that is kept in isolation, prevented from trade with the outside world, and kept at a subsistence level with mass starvation prevented only by food aid from the United Nations and other non-governmental organizations.

Also much of the educational system in Gaza is run by the United Nations Relief Works Agency (UNRWA), whose schools provide free education up to grade 9 for almost half of the school-aged children (Mercer, 2011). Most of the remaining schools in the territory are run by the local government, with very few private schools. There is, however, little information on the impact that the unique conditions in Gaza have on cognitive outcomes of school children. It is widely recognized by educational researchers that social and economic conditions, and in particular the quality of the educational system, are important influences on cognitive attainment (e.g., Batterjee, 2011; Lynn and Vanhanen, 2012). Also the biological factors of health and nutrition need to be considered as possible influences on cognitive development, and as possible causes of IQ differences between countries and across generations within countries (Lynn, 1989).

In their most recent compilation of national IQs Lynn and Vanhanen (2012, p.27) assign an IQ of 84.6 to Palestine. This was based on results of the PISA (Program for International Student Assessment) study of 15 year olds tested in a number of countries in 2009 in mathematics, science and reading. The PISA results are highly correlated with IQ, and have therefore been adopted as a proxy for IQ by Meisenberg & Lynn (2011). In a subsequent study, an IQ of 85 for Palestine was calculated from an administration of the Colored Progressive

Matrices to a sample of 257 children aged 5.5 to 11.5 years attending representative elementary schools in Gaza (Hammad, 2012, reported in Bakhiet and Lynn, 2014). In this paper, we present data for intelligence in Palestine measured with the Standard Progressive Matrices and standardized on a much larger sample that includes ages 8 to 18 years.

1. Method

The Standard Progressive Matrices (SPM) is a test of non-verbal reasoning for children and adults constructed in Britain in the 1930s (Raven, 1939). The test has been administered in many countries throughout the world and is the principal test by which the British IQs for these countries have been calculated (Lynn and Vanhanen, 2012). It is similar to the Colored Progressive Matrices (CPM), but is more difficult and requires more abstract reasoning as opposed to visual matching and recognition. Although designed for individual administration, it is most often group-administered.

The SPM was standardized in Palestine in 2012-2013 by Abu Ghali and Mostafa (2014) on a sample of 1677 boys and 1818 girls aged 8 to 18 years attending representative government schools in the Central, Khan Younis and Rafah provinces of Gaza. The study is described in Arabic in the *Taibah University Journal of Educational Science* and the results are summarized here for those who do not have access to this journal and do not read Arabic.

2. Results

The results are given in Table 1. This shows, reading from left to right, the ages of the sample, the numbers and scores of the males and females on the SPM, and the corresponding scores on the British SPM+ (a more difficult version of the SPM). The conversion from SPM to SPM+ scores was performed because we do not have a recent British standardization of the SPM. The SPM+ was standardized on a representative sample in Britain in 2007 for ages 7 to 18. The scores were converted according to the SPM-SPM+ conversion table given in Raven (1998, Table SPM3, p.70). The last column of Table 1 gives the British IQs according to the SPM+ manual (Raven, 2008), based on the standardization in 2007. No correction for the Flynn effect (secular IQ trend) is applied because in Britain, there were performance gains on the SPM in children but not teenagers between 1979 and 2007 (Flynn, 2009). The existence of robust British Flynn effects after 2007 is uncertain and perhaps unlikely.

Table 1. *Standard Progressive Matrices data for 8-18 year olds in the Gaza Strip*.

	Males		Females		Males and Females	
Age	N	SPM score	N	SPM score	SPM+ score	British IQ
8	130	16.5	133	16.4	12.8	70
9	118	18.2	127	18.3	14.3	65.5
10	128	18.5	131	18.6	14.5	56
11	126	19.3	130	19.5	15.4	58
12	131	19.5	133	19.7	15.6	58
13	128	28.3	133	28.4	21.4	67
14	126	28.4	134	28.6	22.0	65
15	123	35.9	136	35.8	27.0	75
16	234	38.1	263	38.3	28.2	80
17	235	38.6	271	38.5	28.6	77
18	198	39.2	227	39.2	29.2	75.5
8-18	1677	27.3	1818	27.4	20.8	67.9

3. Discussion

There are three points of interest in the results. First, the mean IQ across the eleven age groups is 67.9. This is substantially lower than the British IQs of 84.6 and 85 for Palestine obtained in the two earlier studies summarized in the introduction. However, of these two studies, PISA is not a good indicator for attainment in Gaza because it was based primarily on results from the West Bank, where socio-economic and perhaps educational conditions are far more favorable than in Gaza. According to a working paper from the Washington Institute for Near East Policy, per capita GDP in 2010 was $1924 in the West Bank and $876 in Gaza. (Makovsky and Felder, 2011). These numbers, if reliable, indicate that there are major differences in economic conditions, with Gaza at the level of the poorest African countries and the West Bank coming close to half the per capita GDP of Egypt and one third of Jordan. Both territories are impoverished by regional standards, but Gaza far more so than the West Bank.

The study with the Colored Progressive Matrices (CPM) by Hammad (2012) in Gaza, as reported by Bakhiet and Lynn (2014), included not only 257 children who were tested individually and achieved an IQ of 85. It also included 1001 children who were administered the same test in groups. These scored at an average IQ of 75. The reason for the discrepancy is uncertain. Possibly some of the children, who were in the 6 to 11.5 years age range, did not understand the instructions or were otherwise handicapped in the group setting. In this case the results of the individually administered test are more valid. On the other hand, it

is possible that the advantage on the individually administered test was the result of excessive coaching by the person administering the test. In this case, the results of the group-administered test may be more valid, or at least more comparable with studies in other countries in which the test was administered to groups.

The present data are for the Gaza Strip rather than for the whole of Palestine. Although no further information is available on the West Bank, the far better performance of "Palestine" (West Bank + Gaza) in the PISA test therefore suggests that IQ in the Gaza Strip is lower than in the West Bank. However, this conjecture needs to be tested by administering the SPM to representative samples of school children in the West Bank, or by administering other IQ tests such as the Wechsler scales to subjects in both the West Bank and Gaza.

In addition to the dismal economic conditions, a possible explanation for the lower IQ in the Gaza Strip may be that there has been greater enrolment in school in the Gaza Strip than in the West Bank, given for the year 2000 as 100 vs 93 percent for primary schools and 66 vs 52 percent for secondary schools (Sayre and Al-Botmeh, 2009). Lower school enrolment in the West Bank would be expected to increase school performance and IQ because those not in school likely had lower IQs than those in school.

Another possible explanation for the presumed lower IQ in the Gaza Strip than in the West Bank may be the greater disruptions caused by recurrent military incursions at the time the data were obtained arising from the conflict with Israel. The psychological impact of these recurrent assaults has been documented. One study, after the 2007/2008 incursion, for example, found that health-related quality of life for pre-schoolers aged 3 to 6 years in Gaza was 1.2 standard deviations below the US reference sample and lower than in other low-income countries. In this study, 42% of the mothers had "witnessed bombardment at houses", 28% had "witnessed assassination of people by rockets", and 7% experienced "destruction and stealing of personal things by soldiers" (Massad et al., 2011). Emotional function of pre-schoolers was impaired most, and physical health least. We may wonder whether experiences of this kind can interfere with learning in school and mental development.

Health is another possible factor. According to one theory, improved nutrition and health have been major causes of rising IQ during the 20th century (Lynn, 1989). In Gaza, 34% of preschool children around 2010 were stunted (more than 2 standard deviations below mean in height for age), and 20.3% were classified as wasted (more than 2 standard deviations below mean in weight for height) (Alzain, 2012). The prevalence of stunting was about the same as in West Africa

during the 1990s, and the rate of wasting was higher (15.5% in West Africa, see UN, 2000).

The prevalence of anemia among schoolchildren, caused by iron deficiency in the large majority of cases, is reported as 9.5% in the West Bank and 58.6% in the Gaza Strip in a 2009 study (Rab & Shaik, 2010; see also El Kishawi et al., 2015). The effect of iron deficiency anemia on intellectual functioning is uncertain (Protzko, Aronson and Blair, 2013), but its presence indicates poor nutritional standards and a high likelihood of other nutritional deficiencies which are likely to impair learning and intelligence. Even goiter (caused by iodine deficiency) was present in 15% of children aged 10-12 in Gaza, which the authors of the study attributed to the prohibition of fishing and resulting unavailability of seafood (FAO, 2007).

Second, there are large age differences in IQ. The decline from 70 at age 8 to 58 at age 12 is likely a cumulative effect of adverse education, health and environmental conditions. The increase of IQ from 58 at age 12 to 80, 77 and 75.5 at age 16 to 18 is likely attributable to increasing drop out rates of those with lower IQ. Schooling is officially compulsory for 5-15 year olds in Palestine but there is a 34 percent dropout of those of secondary school age in the Gaza Strip (Sayre and Al-Botmeh, 2009), and the dropouts probably had lower IQs than those remaining in school. The effect of this would be to inflate the IQs of those remaining in school.

Third, males and females obtained virtually identical scores at all ages consistent with results from many samples of children up to the age of 16 years, although some studies have found that males obtain slightly higher average scores than females at the ages of 16 to 18 years (Lynn and Irwing, 2004). These figures are not distorted by different enrolment rates for males and females in Gaza, which are approximately the same at 64.9 percent for males and 66.4 percent for females (Sayre and Al-Botmeh, 2009). However, girls outperform boys in school (Aludayya et al., 2011).

Presumed consequences of low IQ are obvious in Gaza. The most important of them is high fertility. Of all Palestinian refugees in the Middle East, those in the Gaza Strip have the highest total fertility rate (TFR, defined as the average number of children per woman): 5.3 in 1995, 4.4 in 2000, and 4.6 in 2005. By comparison, the TFR of registered refugees in the West Bank was 3.1 in 2005 (Bocco et al. 2011, Fig. 4). According to the World Bank, the TFR in Gaza and the West Bank combined was 4.2 children per woman in 2010, compared with 4.5 in Yemen, 3.5 in Jordan and 2.9 in Egypt (http://data.worldbank.org/indicator/SP.DYN.TFRT.IN). Low intelligence is associated with high fertility rates not only at the individual differences level, but also in comparisons between

countries (Meisenberg, 2009), and the relationship is commonly interpreted as causal (e.g., Lynn, 2011). It is therefore not surprising that the conditions in Gaza are conducive to high fertility and rapid population growth. Today the population of the Gaza Strip is growing at a rate of 3.4% per year. By comparison, the last military incursion in 2014 killed only 0.1% of the population.

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