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Intelligence in Bali — A case study on estimating mean IQ for a population using various corrections based on theory and empirical findings

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ABSTRACT

A high-quality estimate of the mean IQ of a country requires giving a well-validated test to a nationally representative sample, which usually is not feasible in developing countries. So, we used a convenience sample and four corrections based on theory and empirical findings to arrive at a good-quality estimate of the mean IQ in Bali. Our study used $N = 50$ Balinese (age between 7 and 46 years, $M = 16.86$) who took the Standard Progressive Matrices. Correcting for caste membership, school attendance, age distribution, and FLynn-effect gains resulted for the entire Balinese population in an IQ of 79, for adults of 75, and for children of 84. The validity of results is discussed.

1. Introduction

A high-quality estimate of the mean IQ of a country requires giving a well-validated test to a nationally representative sample, taking various background variables into account, such as age, sex, and social–economic status. This is a costly endeavor and therefore in developing countries very few nationally representative samples have been collected. However, using convenience samples and various corrections based on theory and empirical findings it could be possible to arrive at a good-quality estimate of the mean IQ of a country. In this paper we describe how we arrive at an estimate of the mean IQ in Bali.

Indonesia is a developing country located in the tropics covering 13,500 islands with 237 million inhabitants. On the Human Development Index, based on life expectancy, years of schooling, and GNI, it ranks 108 out of 169 ranked countries. Indonesia is ethnically diverse, with Papuans in the east and Malays in the west. With concern to religion, about 86% of the people are Muslim, 9% are Christian, and 3% Hindu.

The IQ for Indonesia is estimated at 87, based on psychometric IQ tests as the Ravens (Lynn & Meisenberg, 2010) using the British "Greenwich IQ norm" (UK as $M = 100$ and $SD = 15$). In student assessment studies (PISA 2000, 2003, 2006, 2009, TIMSS 1999, 2003 and 2007) the average of students in the IQ-scale is at 83, corrected for low school enrollment rates and higher mean age of students being more informative for general youth yields a value of IQ = 78 (UK: 100; Rindermann & Thompson, 2011).

To put these values in perspective, the worldwide mean student assessment score of 100 participating countries (TIMSS, PISA, PIRLS, IEA-Reading, IAEP-II) is in IQ scale 90, the corrected estimate is IQ 87, the worldwide intelligence test mean IQ based on 113 countries is 87 (Lynn & Vanhanen, 2006). Especially Indonesia's crystallized abilities reflected in student assessment results (measuring intelligence and knowledge and its

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intelligent use) are substantially below the world mean. Human capital research suggests this impedes progress towards a modern knowledge economy (Rindermann, 2012) and has important implications for wealth, democracy, liberty, and longevity (e.g. Gottfredson, 2003; Hunt, 2011; Oesterdiekhoff & Rindermann, 2007; Rindermann & Meisenberg, 2009).

Similar to other countries in the region the Chinese minority (about 3%) has a leading position (Harrison, 2006, p. 97; Landes, 1998, chapter 27). In local student achievement tests Chinese score 0.85 *SD* better than ethnic Indonesians (Lynn, 2008, p. 240). They achieved this despite of discriminating laws and practices, expulsions, murders and expropriations in the past (Chua, 2003).

A second minority lives in Bali, where 92% of 3.9 million Balinese are Hindu, making it a Hindu enclave. In the 15th century many leading Hindus (priests, nobility, and artists) fled from other Indonesian islands to Bali. The Balinese culture is famous for its sophisticated dance, costumes, and music. The landscape is shaped by difficult to construct and maintain rice terraces with a complicated irrigation system. The major part of national income depends on tourism, but the majority of people make their living in agriculture. Up to now no intelligence studies had been carried out on Bali, so we carried out a modest-size study. To arrive at a more valid estimate of the mean intelligence level for the whole population we applied various corrections.

2. Method

2.1. Participants

Research participants were collected in schools in the village Batuyang located in the district of Gianyar in the south of Bali, near to the provincial capital Denpasar. Gianyar is a rural, but densely populated region, with the economy dependent on tourism, arts and crafts, and agriculture. Children were contacted first, and adults were contacted through these children's parents, relatives, and neighbors, yielding $N=50$ Balinese between seven and 46 years ($M=16.86$, $SD=10.16$; $N=26$ boys and men, $N=24$ girls and women) participating in the study. The sample was based on willingness to participate in the study, with the adult and younger participants receiving the equivalent of, respectively five and two Euro. More background information on this sample is given below.

2.2. Measures

Our measure of cognitive ability were the Standard Progressive Matrices (SPM; Raven, Raven, & Court, 1998), which consist of 60 figural tasks and are widely used in cross-cultural research (see Brouwers, Vijver, & Hemert, 2009; Lynn & Vanhanen, 2006). We also used an oral biographic questionnaire ascertaining age, sex, religion, caste, education, and additionally mother's age, religion, caste, and education.

2.3. Procedure

The SPM test was taken in a classroom by groups of twelve to fourteen children. Adults were tested in their private surroundings in groups of between two and four persons, and a local assistant made sure that the participants understood the instructions and were working independently.

2.4. Standardization for international comparisons

All international comparisons are methodologically complex: for instance, in student assessment studies country samples differ in mean grade or student age, in student school enrollment rates, in study participation rates, and in within-country differences. Cross-cultural psychometric intelligence test comparisons are even more complex: First, in different countries different tests are used. For our study this is no problem because we use only the SPM. Second, age groups chosen differ, and if younger cohorts have a higher educational level than older ones comparisons between countries using different age groups require thought. Fortunately the majority of studies use young samples (students or young adults). Third, the secular rise of intelligence scores ("FLynn-effect"[1]) lead to easier norms for today's samples (if older norms are used) or difficult norms for older samples (if recent norms are used) (see te Nijenhuis, Murphy, & van Eeden, 2011). Fourth, samples and procedures used for the standardization of test norms are frequently less than ideal. Following Gudjonsson (1995), the 1992 UK SPM adult standardization procedure suffered from unsupervised testing and a too long and not controlled testing time at home, leading to a too narrow range of raw values resulting in low reliabilities. Newer standardizations used a more difficult version of the SPM (SPM+) making norms only applicable after some corrections (Raven, Raven, & Court, 2000). Additionally, the 1979 norms have some irregularities as they do not continuously increase from each age group to the next at all ability levels (e.g., at the top the norms for 7.0- and 7.5-years-old children are easier than the norms for 6.5-years-old children, the same is true for the 8.5 and 9.0 top norms compared to the 8.0 top norms, or the 12.0 years bottom norms are easier than the 9.5 years bottom norms, etc.).

To optimize standardizations we applied the following procedure: 1. We used for children and teenagers up to age 15 the British SPM norms from 1979 (Raven, 1981). British norms represent the "Greenwich norm", often used in international comparisons. 2. We used for adults (18 years and older) the 1993 US norms (Raven, Raven, & Court, 2003). The US population is similar to the UK population, but because in international comparisons the US scores are 1.51 IQ points below the UK scores we apply a correction of −1.51 IQ points so they are in line with the Greenwich norm. 3. Many tests, including the SPM, present norms for adults by age group. In the US norms there is nearly no change between age 20 and 45 (our age range for adults: 18 to 47 years) so we used only the norms for the 18- to 22-year-old group. Additionally, every age standardization for adults would hide cognitive development in adulthood. 4. The US SPM manual does not report norms for persons

[1] "FLynn effect", a combination of the names of the two men who rediscovered secular score gains in intelligence, namely Richard Lynn (1982) and James Flynn (1984).