

Reply to Bailey et al. and Daly: Indigenous societies enable identification of nurture but require nonstandard measures

Policy-makers and activists have control over nurture but not nature. Thus, identifying the effect of changing nurture without directly altering nature is imperative for understanding whether we can reduce gender differences. The Khasi and Karbi offer a unique “natural experiment,” allowing us to identify the effect of “changing” nurture without directly altering nature. Standard cross-cultural studies cannot achieve such identification because nurture often covaries with, for example, genetics. Although experiments, such as those that manipulate stereotype salience or training, enable us to identify the role of nurture, they do not enable us to know if changes to nurture could have a dramatic impact on an entire society. This natural experiment is the main methodological innovation of our paper. To our knowledge it is the first comparison of two matched societies, used to identify the role of nurture while holding constant nature.

Unfortunately, this sample comes at a cost: Standard measures of spatial abilities are too abstract for our subjects, who are near-subsistence indigenous villagers, and whose education consists of practical know-how, such as how often crops should be rotated, and a fact-based curriculum required by the state, such as what is the capital of India. In fact, we tried to have our subjects play a children’s memory game, Simon (Fig. 1*A*), but we were unable to train subjects. Our puzzle measure actually began as a 12-piece puzzle with the five unrelated sides uncovered (Fig. 1*B*); however, after subjects took more than 15 min to complete the puzzle, we covered five of the sides, then removed 6 of the pieces, and then removed 2 more pieces.

We therefore agree with the sentiments of Bailey et al. (1) and Daly (2): Our study should not be viewed as the definitive study on this topic but as a proof of concept, which should propel researchers to exploit this unique sample to its fullest advantage. Further research using noncognitive measures, as well as alternative spatial measures would prove invaluable in addressing some of the shortcomings pointed out by Bailey et al. (1) and Daly (2). Moreover, such research would reveal the generality of our results and could focus activist efforts on traits that are most amenable to nurture. Also, if the measures are chosen to be more or less gender-dimorphic and more or less influenced by motivation, stereotype threat, and training, for example, this research, in addition to addressing some of the astute criticisms of Bailey et al. (1) and Daly (2), could also reveal mechanism, which would likewise be invaluable for focusing activists’ efforts. We welcome collaboration with psychologists and anthropologists, such as the experts to whom this letter replies, to help us develop such measures of spatial and nonspatial cognitive



Fig. 1. Two measures that were too complex for our sample. (*A*) Game of Simon requires individuals to repeat a sequence of flashing lights (e.g., red, blue, yellow). We attempted to use this game as a measure of short-term memory, a nonspatial cognitive ability. Subjects consistently pressed the most recent light, (e.g., yellow), despite several different research assistants’ attempt to explain the notion of a “sequence.” After a handful of subjects, we dropped the measure and could not come up with a replacement in time. (*B*) This 12-piece, six-sided puzzle served as our original measure of spatial abilities. Subjects were taking longer than 15 min to solve the puzzle, leading us to cover the five unrelated sides. When the puzzle still proved too time-consuming, we removed half of the pieces. When the puzzle still proved too time-consuming, we removed 2 more pieces, thereby settling on our final measure.

abilities that are easy to explain and quick to implement, to take full advantage of this unique sample.

Response to Specific Criticisms

We disagree with Bailey et al. (1) and Daly (2) that our measure obviously resembles the three they present (Fig. 2). It is not clear to us which measure our puzzle most resembles, nor does it seem clear to Bailey et al. (1) and Daly (2), who mention three different possibilities. Moreover, all measures of spatial abilities involve a complex mixture of cognitive traits, making it unlikely that ours maps directly onto any. For instance, one volume on intellectual assessments (3) notes:

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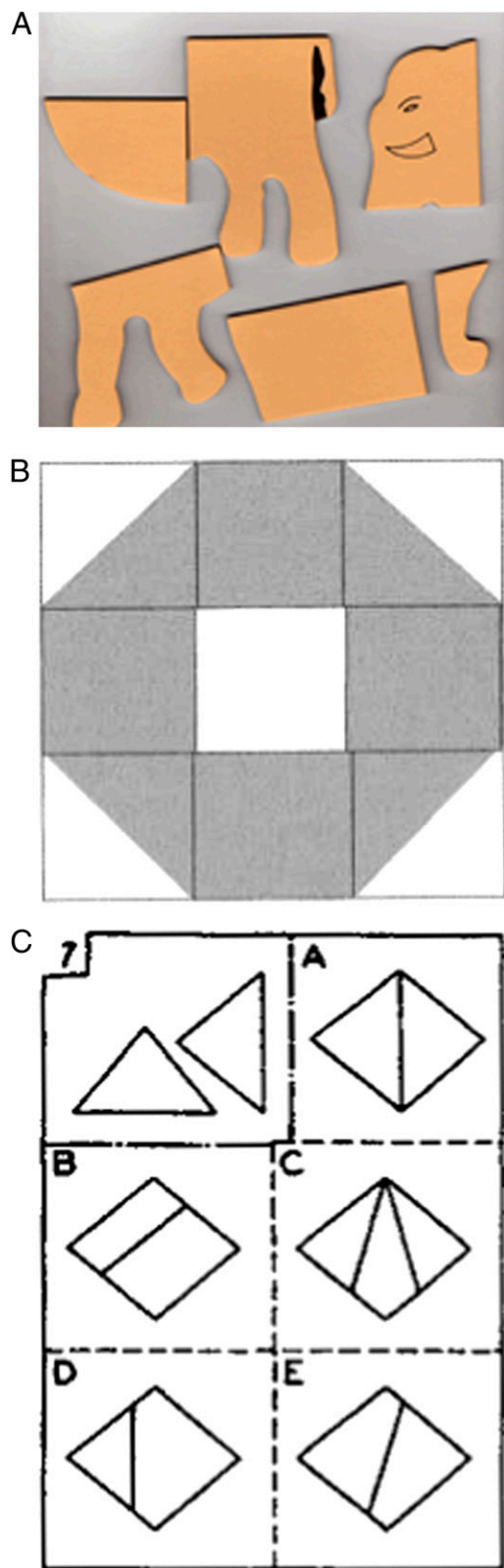


Fig. 2. Three separate measures that Bailey et al. (1) and Daly (2) argue are most similar to ours. (A) In the object assembly measure, subjects form an identifiable object from several differently shaped pieces. (B) In the block design measure, subjects arrange two-colored blocks to repeat a design. (C) In the paper form board measure, subjects pick an image from A–E that can be produced from a focal image (Upper Left).



Fig. 3. Billboard in the nearby city of Shillong, where Khasi ex-village men are demanding equal rights.

object assembly is designed to assess perceptual organization, integration and synthesis of part-whole relationships, and use of sensory-motor feedback. It also involves spatial ability, fluid ability, visual-motor reasoning, trial-and-error learning, visual-motor coordination, cognitive flexibility, persistence, motor coordination, and dexterity... nonverbal reasoning, speed of mental processing, and anticipation of relationships.

We share the concern of Daly (2) that motivational/personality confounds may exist in our measure. However, we would have this same concern for other measures as well. The aforementioned volume states “[object assembly is influenced by] cognitive flexibility, persistence, motor coordination, and dexterity” (3). If anything, we are less concerned with our measure because the large financial incentives (1/4 of a day’s wage) should motivate even the most indolent of subjects. Moreover, after our subjects waited in line upward of an hour in the rain, when it came time to solve the puzzle, even the most inattentive could concentrate for the requisite 30–60 s. Far from being a simple task, only 607 of 1,279 subjects earned the bonus. We also see no problem if our results, in fact, were fully driven by motivation/personality, because motivation/personality affects performance in standardized tests, science, technology, engineering, and mathematics (STEM) classes, and STEM careers as well. Thus, the implications of our research for those wishing to reduce the gender gap therein would not be dramatically altered, even if the cognitive interpretation were different.

We agree with Bailey et al. (1) that the Khasi are not gender-equal. Women cannot be religious or political leaders, and the Khasi do show a stark division of labor, with women tending to the home and men to the field.

However, we disagree with Bailey et al. (1) that Khasi women are not treated better than Karbi women, which is all we needed for our purposes. Women, as is legally dictated, are the sole property owners among the Khasi, whereas women are the minority property owners among the Karbi (4). Despite the claim of Bailey et al. (1) to the contrary, the original source provided by these researchers does show that descent system correlates with treatment of women (ref. 5, pp. 133–134 and

table 8). In that work (5), it is stated that matrilineal and matrilocal societies offer:

more domestic authority, more ritualized female solidarity, more equal sexual restrictions, and perhaps more value placed on their lives. . . the best general summation is that. . . matrilineal descent and matrilocal residence are associated with certain benefits for women.

However, we need not resort to correlations across societies; we presented data on the treatment of women in the Khasi and Karbi according to the one substantive and objective measure we collected—number of years of schooling (4). If the reader feels education is unrepresentative, we offer this visual of a billboard sponsored by the men's right's movement, which speaks for itself (Fig. 3).

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