Supporting Information

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SI Methods

We carried out our investigation in rural areas of Guatemala, where almost 80% of adults have little or no literacy skills, in a country whose literacy rate and World Human development Index (HDI) are the second lowest in the Latin American and Caribbean region (1–3). The first author (L.F.) spent two years in Guatemala. In the first year, she lived in a rural village of Chimaltenango department, working for a nonprofit organization as child-care counselor and family service assistant. During this period, she became familiar with the local social practices, and acquainted with several teachers and coordinators of the national literacy program (CONALFA). In the following year, she tested the bilingual adult participants and the child participants, and she instructed the bilingual research assistant.

In each study, L.F. tested the bilingual Mayan adults and children, and trained a bilingual indigenous assistant to administer the tasks to the monolingual Mayan adults. The teachers of the literacy program (CONALFA) introduced the study to adult participants, describing it as a series of games in which participants could obtain a prize, and making it clear that participants were free to withdraw from the trial at any time. Participants received the prize (a stationery item for adult participants, a candy or a sticker for child participants) for each bet that turned out to be correct. The controls were adults from Northern Italy, recruited via email. Their participation was voluntary, and they completed a computerized version of each task.

SI Study 1. Prior and Posterior Evaluation

Participants. In the two groups of adult participants (31 women), the ages ranged from 22 to 53 y (mean age: 41 y). In all studies, the age of adult Mayan participants could not be determined with precision because some of them did not know the year of their birth. In the child group (13 girls), the ages ranged from 7 y, 3 mo to 9 y, 0 mo (mean age: 8 y, 3 mo). All children attended the first or second year of the primary school, taught in Spanish. In the Italian control group (11 women), the ages ranged from 25 to 57 y (mean age: 33 y). We tested eight further Mayan adults and two children, but we did not consider their answers because of an error in the experimental protocol.

Procedure. All participants started with the prior task. Half of them received a version of it in which the prevalent color was yellow. For the other half, the opposite held. Presentation of the other two tasks was counterbalanced across participants. In one condition, participants received a confirmation version of the posterior task, and a disconfirmation version of the updating task. In another condition, the opposite held. The shape of the selected chip (round vs. square) was counterbalanced across versions. Half of the participants received the tasks with a given allotment of colors (e.g., in the confirmation version, five red chips and three green chips). For the other half, the opposite held (e.g., in the confirmation version, three red chips and five green chips).

SI Study 2. Quantity vs. Proportion

Participants. In the two groups of adult participants (34 women), the ages ranged from 17 to 70 y (mean age: 39 y). We tested 2 further Mayan adults, but we did not consider their answers because of an error in the experimental protocol. In the child group (five girls), the ages ranged from 6 y, 6 mo to 7 y, 6 mo (mean age: 7 y). All children attended the Spanish preparatory class, in which they learn basic literacy and numeracy skills, before starting the primary school. In the Italian control group (10 women), the ages ranged from 18 to 42 y (mean age: 28 y). To have the baseline data on Western children's performance in probabilistic tasks requiring proportional reasoning, we also tested 20 Italian children: 10 girls (ages ranging from 5 y, 0 mo to 6 y, 3 mo; mean age: 5 y, 7 mo). They attended a Northern Italian public school.

Procedure. The boxes of Task A contained 48 red vs. 48 black chips, respectively. The boxes of Task B-left panel contained 12 red and 36 black vs. 48 red chips, respectively. The boxes of Task B-right panel contained 36 red and 12 black vs. 12 red chips, respectively. The boxes of Task C-left panel contained 36 red and 12 black vs. 12 red and 36 black chips, respectively. The boxes of Task C-right panel contained 9 red and 3 black vs. 12 red and 36 black chips, respectively. The position (left/right) of the boxes and the cardboards, and the order in which the chip sets were put into the boxes, were randomized across participants.

SI Study 3. Probability and Combinatorics

Participants. In the adult participant group (34 women), the ages ranged from 18 to 57 y (mean age: 38 y). In the child group (10 girls), the ages ranged from 8 y, 5 mo to 10 y, 3 mo (mean age: 9 y, 2 mo). All children attended the third or fourth year of the primary school, taught in Spanish. In the Italian control group (13 women), the ages ranged from 19 to 50 y (mean age: 27 y).

Scoring. We classified each participant's performance as a function of the expected value of her or his bets. In each task, the probability of getting a reward equals the probability that the bet is correct and, thus, the proportion of expected reward. In the 15 vs. 1, 7 vs. 1, and 3 vs. 1 tasks, the probability of getting two chips of the same color is 7/8, 3/4 and 1/2, respectively. In the 2 by 2, 4 by 2, and 8 by 2 tasks, such a probability is 1/3, 1/7 and 1/15, respectively. If one wants to maximize the expected number of rewards, one should bet on "same color" in the first two tasks, and on "different colors" in the last three ones. These bets yield an expected number of rewards equal to $7/8 + 3/4 + 1/2 + 2/3 + 6/7 + 14/15 = 4.58$. Accordingly, it is possible to attribute an expected value V to each individual pattern of prediction. Each pattern is a sequence of answers to the 6 tasks. There are two possible answers to each task ("same color" vs. "different colors"). Therefore, there are 2^6, namely, 64, possible prediction patterns. By taking into account these patterns, the distribution of V, which is symmetrical, ranges from 1.42 (V_{min}) to 4.58 (V_{max}), and its mean (V_{mean}) = 3, where V_{mean} is the mean expected value of randomly distributed predictions. To evaluate the quality of a given prediction pattern, we computed an index Q, by normalizing the expected value V, as follows: $Q = 2(V - V_{mean})/(V_{max} - V_{min})$. The Q index is equal to 0 when $V = V_{mean}$, that is, when V equals the expected value of random predictions, and it ranges from -1 (worse quality, when $V = V_{min}$), to + 1 (best quality, when $V = V_{max}$).

Analysis of Performance Across Trials. In all studies, we motivated participants by asking them to make actual bets, which could yield them some reward, rather than disinterested evaluations. In Study 3, participants made six bets. Thus, one might argue that the feedback participants received after each bet affected their performance. To rule out this interpretation, we computed a separate Q for the first three and the last three tasks. (We could do this analysis because the succession of tasks

differed across participants, but just about the same number of participants received a given task in each possible rank). In all groups, the initial Q was similar to the final one: Monolingual Maya, 0.44 (SD = 0.49) vs. 0.34 (SD = 0.70), respectively, $t(19) = 0.65$, $P = 0.52$; Bilingual Maya, 0.82 (SD = 0.39) vs. 0.85 (SD = 0.36), respectively, $t(19) = 0.20$, $P = 0.84$; Mayan school children, 0.55 (SD = 0.47) vs. 0.63, (SD = 0.59), respectively, $t(19) = 0.50$, $P = 0.63$; Italian controls, 0.79 (SD = 0.41) vs. 0.84 (SD = 0.33), respectively, $t(19) = 1.83$, $P = 0.08$.

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2. UNESCO Institute for Lifelong Learning Integral Family Literacy: Country Profile Guatemala, (2012). Available at www.unesco.org/uil/litbase/?menu=16&programme=94. Accessed January 26, 2014.
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Fig. S1. A K'iche' woman participant taking the prior-posterior evaluation task (Study 1) under supervision of the first author (L.F.), in Nahaualà (2013).

Fig. S2. A K'iche' woman participant listening to the research assistant's instructions in the quantity vs. proportion task (Study 2), in Nahaualà (2013).

Fig. S3. A K'iche' woman participant making her bet in the quantity vs. proportion task (Study 2), in Nahaualà (2013).

Fig. S4. A K'iche' woman participant taking the probability-combinatorics task (Study 3), in Nahaualà (2013).