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WASHINGTON UNIVERSITY

Department of Psychology

Ownership Intuitions and their Effects on Allocations in the Dictator Game

By

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Abstract

People's implicit assumptions about ownership might influence their decisions in Dictator Games (DG), leading to generosity. Two studies tested subjects' intuitions concerning ownership in fictional situations structurally analogous to the DG. Subjects read a story about a ritual in which an old man (experimenter in DG) provided an endowment that Person 1 (dictator in DG) had to allocate between self and Person 2 (receiver in DG). Subjects were told that in some instances the ritual was interrupted before completion. As an assay of their intuitions regarding ownership, subjects were asked who owned the endowment and how it should be allocated after such interruptions. Results suggest that subjects assume the endowment primarily belonged to the experimenter throughout the DG, except when the dictator worked for it. These property right intuitions might account for allocation decisions in actual DGs.

Keywords: ownership, property rights, dictator game

Ownership Intuitions and their Effects on Allocations in the Dictator Game

Without shared assumptions underlying ownership and property rights, most human interactions, economic behavior, and culture would be unrecognizable. The concept of ownership is integral to cooperation, trust, morality, social status, and altruism. In the modern world, nearly all objects humans interact with have owners. Conflicts over ownership are the basis for careers and legal institutions. Despite the prevalence and importance of ownership, there has been relatively little psychological research on it.

How is Ownership Represented and Inferred?

Humans represent ownership over more forms of property and with greater complexity than any other organism. Many scholars, notably legal positivists, believe property rights to be a recent phenomenon, relying on a modern state and rule of law. As Jeremy Bentham put it, “Property and law are born together, and die together. Before laws were made there was no property; take away laws, and property ceases,” (Bentham, 1931, p. 113). Legal positivism remains the dominant view in United States law today (Sprankling, 2012). Because the law is in principle a deductive process, this view of the psychology of ownership seems to suggest that representations flow from “top down” reasoning about laws or rules.

This idea faces several difficulties. First, legal battles over ownership are pervasive, suggesting that laws don’t reliably give rise to common ownership intuitions (Dukeminier, Krier, Alexander, & Schill, 2010). Ownership can be shared, uncertain, and ambiguous. For example, when an engagement is terminated, depending on the circumstances, people often feel both parties share ownership of the ring (Kruckenberg,

1997). Second, much of ownership psychology is unconscious. The experience of inferring an owner usually does not involve deliberate reasoning but rather an intuition arrives effortlessly into consciousness, (see Haidt (2001) for a parallel model of moral judgments). Lastly, there is extensive documentation of ownership psychology in non-humans. These examples support the idea that ownership psychology played a role in human evolution, and it is likely that ownership predates modern civilization (Gintis, 2007). An alternative view of ownership psychology is that, like many other species, humans possess specialized cognitive circuitry which accepts cues from the environment, integrates them with relevant information in memory, and generates beliefs, sometimes probabilistic or distributed among multiple parties, about owners and their property rights.

Examples of animals that represent a form of property rights abound. Scholars have found that animals represent ownership over territory, food, water, valued objects, and mates. One cue animals use to determine ownership is temporal – they represent which individual or group occupied a territory first or for how long. Davies (1978) studied this phenomenon in speckled wood butterflies, which attract more mates when they occupy a spot of sun beneath the forest canopy. Males dispute the ownership of a sunspot by engaging in a “spiral flight,” a brief flight in which two males circle one another, one flies away, and the other returns to the sunspot. Davies observed that after each spiral flight, the intruder always yielded, while the owner always retained the territory. Next he removed some owners, waited for new males to occupy the territory for ten seconds, and then returned the original owners. Original owners were never successful in

displacing new ones. In a final manipulation, he secretly introduced an intruder such that the owner did not notice. The result was that both males “believed” they were the rightful owner, and engaged in spiral flights ten times longer than normal. Davies inferred that the butterflies solved disputes using the rule “resident wins, intruder retreats,” and that the time spent in or out of the territory determined ownership.

Another cue animals use to settle territory disputes is number. Wilson, Hauser, and Wrangham (2001) studied groups of chimps in the Kibale National Park in Uganda. Males defend their territory by fighting intruders, but they choose to engage only when the ratio of defenders to intruders is sufficiently favorable. Wilson et al. (2001) recorded a “pant-hoot” (a call chimps produce throughout the day) of a foreign male and then played the call from speakers to groups of resident males. They found that when the groups of resident males numbered three or greater, they approached the sound and showed signs of aggression. Otherwise they remained silent and did not approach. Stevens (1988) observed groups of feral horses competing over pools of fresh water in the Rachel Carson Estuarine Sanctuary. Resident groups usually won disputes but in the cases where intruder groups won, the intruding group was larger.

Dominance and gender also affect decisions about property rights. Sigg and Falett (1985) gave a can of food to a subordinate baboon for five minutes, allowing a dominant baboon to observe. Next they allowed the dominant to enter the subordinate’s cage and observed if the dominant took the can within thirty minutes. They varied the sex of the dominant and subordinate individuals in different conditions. Males took the

can from females on two thirds of the trials and females took it from females on half the trials. Neither males nor females ever took it from males.

Kummer and Cords (1991) conducted a particularly interesting set of experiments, demonstrating more subtle cues that long-tailed macaques used to determine ownership over a tube of raisins. In three experimental conditions they 1) allowed a subordinate macaque to spend time with the tube in an enclosed area where the tube was fixed to an immobile object, 2) allowed the subordinate to hold the tube in its hand and move around with it, or 3) tied the tube to an immobile object with a short rope but allowed the subordinate to hold the tube in its hand and move it. In each case they allowed a dominant macaque to enter the room and observed if the dominant contested ownership over the tube. Only when the tube was fixed to the immobile object and impossible to grasp or move did the dominants always contest ownership of it. When the subordinate could possess and move the tube, even when it was tied to short rope, dominants never contested ownership. Many more studies demonstrate representations of ownership throughout the animal kingdom (Beletsky & Orians, 1989; Haley, 1994; Kemp & Wiklund, 2004; Olsson & Shine, 2000); for a detailed discussion of several see Alcock and Farley (2001).

Moving into research with humans, one way scholars have explored cues that influence ownership has been by studying children. Because children have limited experience and linguistic abilities, findings that they represent property rights and ownership suggest that these phenomena do not have to be acquired through a general social learning process. Furby (1978), in early work in this area, interviewed children in

kindergarten, second, fifth, and eleventh grade as well as forty and fifty year old adults. Interviews included open ended questions like, “What does it mean that something is yours, that it belongs to you?”; “Why do you think people have things that belong just to them-why do people own things?” (Furby, 1978). The researchers identified 290 categories of responses, which they used to code the content of all the interviews. Among the young children, current use of an object was the most commonly mentioned feature of ownership along with the right to control or allow who used the. (These patterns held for adults too). Children also responded that objects enable some activity or enjoyment for the owner and that the owner had a responsibility to care for the object.

Eisenberg-Berg, Haake, and Bartlett (1981) paired 3-5 year old subjects with classmate controls of the same gender and age. They gave each subject a toy and said either “It’s yours to keep” or “It belongs to the group.” Children in the “it’s yours” condition possessed the toy longer, defended it from others more, and made more statements about owning it. Although this study did not demonstrate inference of ownership from nonverbal cues, it did show that young children understand property rights including the right to possess, use, and exclude others from using an object that one owns.

Hook (1993) worked with 4-15 year old subjects as well as adults. In one experiment, researchers told subjects stories about people who acquired an object in different ways (found, stole, received as gift, and borrowed) and then refused to return the object to the owner. They asked subjects to rate how bad the characters’ behavior

was in each story. Younger children had a harder time distinguishing between wrongness of different modes of acquisition whereas older children thought stealing and borrowing were worse than finding or receiving as a gift. In another experiment, researchers examined the cues of first possession and creative effort. They told subjects a story about Damien, who possessed a block of wood then lent it to Alex who carved a valuable statue out of it, which an art dealer offered to buy. Damien wanted the wood back, to sell it to the art dealer, but Alex refused. Most subjects thought that Damien owned the wood but when asked who should receive the money from the art dealer, they responded that Alex should receive most of it.

Friedman and Neary (2008) conducted several experiments looking at how 2-4 year old children use a “first possession heuristic” in determining ownership. They told children stories about two puppets that played with a toy, one after the other. Afterward, the researchers placed the puppets and the toy before the children and asked, “Whose toy is it?” On average, all age groups said the first possessor was the owner even when experimenters placed the toy next to the second possessor.

In a study on infants’ understanding of antisocial behavior, Hamlin, Wynn, Bloom, and Mahajan (2011) incidentally demonstrated a possible understanding of ownership in infants as young as five months. Seeking to test whether infants would prefer those who helped as opposed to those who hindered, they showed them a puppet playing with a ball and then dropping it. In the “help” condition, a second puppet retrieved the dropped ball and returned it to its owner. In the hinder condition, the second puppet picked up the ball and disappeared with it. When presented with a choice of which puppet to play

with, infants preferred the helper. The notion of helping and hindering, in this case, might have relied on an understanding that the first puppet owned the ball and absconding with it was antisocial because it violated property rights. The studies described here, along with several others (Bakeman & Brownlee, 1982; Eisenberg, Bartlett, & Haake, 1983; Fasig, 2000; Ross, 1996), have begun identifying cues that influence ownership but the body of literature remains slim.

Property Rights & the Dictator Game

One mature area of study that potentially offers a window into ownership psychology, especially as it functions in adults, is behavioral economics. Economic interactions regularly require people to make decisions about allocating, taking, sharing, giving, and excluding, and all of these phenomena involve ownership and property rights. The Dictator Game (DG) is one of the simplest and most popular designs in behavioral economics. Kahneman, Knetsch, and Thaler (1986) invented a form of the DG consisting of two rounds. In round 1, subject A (the dictator) could allocate \$20 between self and subject B, evenly or unevenly. In round 2, subject C could allocate additional money between self and subjects A and B, depending on what subject A did in round 1. Subsequently Forsythe, Horowitz, Savin, and Sefton (1994) simplified the game to involve just a dictator and an anonymous receiver. In the canonical form today, the dictator is presented with an endowment (often \$10) which she may allocate between self and an anonymous receiver however she likes. Dictators typically give away about 20%-30% of the endowment (Camerer, 2003). Over the years, the influence of the DG has been substantial. One review counted 129 publications and 41,443 DG

observations between 1992 and 2009 (Engel, 2011). These studies constitute one of the most significant explorations into human cooperation, generosity, altruism, trust, and fairness.

A question that has spurred continuing DG research is why dictators give to strangers. From the standpoint of standard neoclassical economics, one might expect self-interested, money-maximizing subjects to keep the whole endowment. A number of explanations have been proposed to explain the standard DG results. One is inequity or inequality aversion (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999). Proponents of these theories contend that subjects are self-interested but that they also prefer to avoid greater differences in payoffs. In the DG, inequity aversion could cause subjects to avoid the most disparate payoffs like \$10 for dictator and \$0 for receiver. Indeed, a common choice for dictators is an even 50/50 split (Engel, 2011). Mixing the preference to avoid inequality with self-interest might explain the why dictators on average give away 20%-30%. Other theorists propose that people have “maximin” preferences, that is, the preference to maximize the minimum payoff (Charness & Rabin, 2002; Engelmann & Strobel, 2004). This idea formed a pillar of John Rawls’ theory of distributive justice: “The basic structure is perfectly just when the prospects of the least fortunate are as great as they can be,” (Rawls, 1999, p. 138). Again, mixing a maximin preference with self-interest could lead to the observed DG results. Another influential theory is a reformulation of rational choice theory to include as a payoff the positive feelings of prosocial behavior like giving. It could be “payoffs” include more than merely the amount of money people receive from the DG. Factoring in positive feelings

as part of the payoffs, allows a self-interested model to account for DG findings (Andreoni, 1990).

While these theories capture important facts about human preferences, we believe an alternative idea, focused on ownership and property rights might contribute to understanding DG behavior. Current theories focus on modeling preferences while remaining largely silent on what cognitive processes people use to satisfy their preferences. In addition, they do not examine ownership directly, focusing exclusively on preferred outcomes without accounting for prior ownership of resources. Because subjects often pass quizzes demonstrating their explicit knowledge of the rules of the game and consequences of their choices, some scholars seem satisfied that confusion over ownership doesn't exist (Baumard & Sperber, 2010; Henrich, 2000).

Several studies provide evidence that property rights affect DG decisions. Hoffman, McCabe, Shachat, and Smith (1994) included three manipulations to the DG and Ultimatum Game (UG). First, rather than randomly assigning certain subjects to be dictators, they asked subjects to take a general knowledge quiz and then told the entire group that those who scored highest on the quiz had "earned" the position of dictator and hence, control over the endowment. Second, rather than framing the interaction as dividing money between self and an anonymous other, they instructed dictators that they were involved in an "exchange" in which the dictator was a "seller" and the receiver was a "buyer." The dictator chose a division of money to "sell" to the receiver, which, in the case of the DG, the receiver simply had to accept or "buy." Third, they included a double-blind condition in which they provided dictators with envelopes

containing ten \$1 bills and ten blank slips of paper, except two random dictators who received envelopes with twenty blank slips of paper and no money. Only the individual dictators knew which envelope they had received. Each dictator was instructed to remove slips of paper and dollar bills, however they wanted, such that the total number removed equaled ten (\$3 and 7 slips of paper for example), then seal and return the envelope. This procedure ensured that only individual dictators knew their decisions.

Each of these three manipulations reduced giving. Changes in how dictators inferred their ownership over the endowment might account for the results. If one truly owns something, one is not compelled to give it away. Hoffman et al. (1994) describe a property right as a guarantee that you will not be punished for what would otherwise be considered a punishable offense: “The guarantee is against reprisal, in that a property right places restrictions on punishment strategies which might otherwise be used to insure cooperative behavior” (pg. 350). In the case of the DG, dictators give less when they infer that their property rights allow them to do so. Earning something is an intuitive way that ownership is transferred. Many other studies involving DGs and UGs support the idea that when people earn the endowment they have more of a right to keep it (Cherry, Frykblom, & Shogren, 2002; Hoffman & Spitzer, 1985; List, 2007; Oxoby & Spraggon, 2008). “Selling” a division of the endowment to the receiver could have given rise to an inference that to sell something one must own it first. The relationship between the double-blind condition and ownership is less direct. By allowing dictators to make their decisions with total secrecy, the manipulation did not impact inferences about ownership. Rather, it achieved what property rights normally do: a guarantee not

to be punished. True anonymity left dictators with the ability to behave selfishly without any fear of reprisal, even in the form of a disapproving look from the experimenter.

Investigating Cues of Ownership in the DG

The canonical DG might evoke a certain degree of confusion or at least ambiguity with respect to property rights because different cues for ownership point to different players. Normally, the experimenter is the first possessor, there is no legitimate transfer of ownership to the dictator, but the dictator has the power to allocate. This confusion over ownership could be important for explaining dictator behavior, considering that previous studies demonstrate that when property rights are manipulated, giving decreases. We wanted to examine intuitions about ownership in the DG as directly as possible by asking subjects about them, while manipulating variables that we had reason to believe were relevant to ownership.

In 1654, Blaise Pascal famously invented probability theory to solve the following problem: If a game of chance is interrupted before completion and players have different chances of winning (they hold different cards in a game of poker for example), how can the stakes be divided fairly (Hacking, 1984)? This exercise inspired our design to probe ownership intuitions in the DG. If the DG is interrupted at various stages, who owns the endowment and how should it be divided? Subjects read about a fictional DG which was interrupted after key events. Subjects were asked to judge who owned the endowment, how the endowment should be allocated with the interaction interrupted, and to rate the moral wrongness and unfairness of different allocations.

Predictions were as follows: 1) Subjects' judgment of who owned the endowment would change depending on the stage of the game, with the experimenter owning the endowment earlier due to the first possession cue and the dictator owning it during or after allocation because giving might confer ownership. 2) At various points in the game, ownership would be distributed among experimenter, dictator, and receiver. That is, ownership would not be exclusive but rather shared. 3) Subjects' judgments of who owned the endowment and their decision of how they would allocate the endowment would be strongly correlated. 4) Judgments of ownership, allocation, fairness, and moral rightness would be positively correlated by virtue of the intuition that it is fair and morally right for someone to keep something when they own it. 5) If there were a legitimate cue signaling a shift in ownership from experimenter to dictator, (e.g., if the dictator worked for the endowment), then subjects would judge the dictator to be the owner more than the experimenter. Experiment 1 was designed to test the first four predictions.

Experiment 1

Method

Design

We asked subjects to read a story analogous to the Dictator Game. The story is about a custom called "The Meeting" which took place medieval times. According to this custom, the oldest man in the village (experimenter in DG) recruits two random villagers, Person 1 and Person 2 (dictator and receiver), at the marketplace. He invites each to his house (research laboratory) to participate in an interaction and promises

them a free meal for showing up (payment for participation). In one room in the house, the old man presents Person 1 with two boxes. Box 1 contains 10 eggs (the endowment) and box 2 is empty. Person 1 can allocate however many eggs he wishes to Person 2 by taking them from box 1 and placing them into box 2. Then the old man goes to a different room in the house and gives box 2 to Person 2, both Person 1 and Person 2 receive a free meal, and they leave with their boxes. The old man covers his eyes during Person 1's decision and keeps the identities of Person 1 and Person 2 secret.

Subjects first read how The Meeting normally went, that is when the DG was played to completion. Next subjects read one of several different accounts of when The Meeting was interrupted at some key moment because lightning struck the old man's house. We included illustrations to assist subjects' understanding (see Appendix A). After reading each story we presented subjects with a simple quiz to test their understanding. If they did not answer correctly we eliminated them from the study.

We chose the following points at which to introduce an interruption: 1) Just before the old man entered the room where Person 1 was, 2) just before Person 1 made a decision, 3) just after Person 1 made a decision (we did not specify what the decision was), and 4) just before the old man gave Person 1's allocation to Person 2 in the other room.

Subjects

197 subjects from the United States, among them 120 women, were recruited using Amazon Mechanical Turk. Ages ranged from 18 to 75, $M = 32.06$, $SD = 12.38$. Subjects were randomly assigned to each of the experimental conditions.

Materials

The experiment was conducted via a web-based survey service (www.qualtrics.com).

Each scenario was presented on a different page along with questions.

Elimination quiz

Subjects answered two multiple choice questions. One was, “Which of the following events occur in The Meeting?” The choices were A) Person 1 and Person 2 don't meet each other B) The oldest man in the village meets Person 1 and Person 2 C) The oldest man in the village doesn't tell Person 2 who Person 1 is D) Person 1 and Person 2 get free meals E) All of the above F) The first two choices only. The correct answer was, “All of the above.” The second question was, “Which of the following events does NOT occur in The Meeting?” The choices were A) Person 1 decides how many eggs to put into box 2 B) Person 1 and Person 2 meet C) The oldest man in the village covers his eyes so he doesn't see what Person 1's decision is. The correct answer was, “Person 1 and Person 2 meet.”

Ownership, allocation, morality and fairness items

Subjects answered a forced choice question, “Who owns the eggs?” choosing between old man, Person 1, or Person 2. Next subjects answered the question, “Who should keep the eggs? Please enter the number of eggs that you think each person should keep.” They entered a number for old man, Person 1 and Person 2. The total had to add up to ten eggs. Next subjects responded to three items on a 1-7 scale. The items were, “Please enter how morally wrong you think it would be for each person to keep all the eggs after The Meeting is interrupted,” “Please enter how unfair you think it

would be for each person to keep all the eggs after The Meeting is interrupted,” and “To what extent do you think each character in the story owns the eggs, after The Meeting is interrupted?”

Procedure

Subjects completed the experiment over the internet. They read an informed consent document, read the instructions, and began the experiment. After finishing the experiment, subjects provided demographic information. The procedure took about 20 minutes. Procedures were approved by the University of Pennsylvania Institutional Review Board.

Results

We first tabulated ownership decisions, that is, subjects’ decisions about who owned the eggs (the endowment) at the different times when the interruption occurred. The results of the forced choice measure are shown in Table 1. The difference among conditions was significant, $\chi^2(6) = 33.19, p < .001^1$. Given the hypothesis that ownership intuitions change due to cues like first possession and allocation, we explored the differences between interruption times, in the order they occur in the DG (in other words we compared neighboring interruption times). The difference between 1 and 2 was significant, $\chi^2(1) = 16.88, p < .001$. This could be because after interruption 1, the first possession cue caused subjects to infer that the old man (experimenter) was the owner but after interruption 2, more subjects judged Person 1 (dictator) to be the

¹ Where cells had a sample size less than 10 we ran Fisher’s exact tests which showed the same groups to be significantly different as a traditional chi-square analysis.

owner because he was about to allocate. The remaining differences, between 2-3 and 3-4, were not significant, $\chi^2(1) = 1.92, p = .17$ (df was only 1 because cells for Person 2 (receiver) contained 0 and were not included) and $\chi^2(2) = 5.32, p = .07$.

Subjects rated to what extent they believed each character owned the eggs after the DG was interrupted, from 1 (no ownership) to 7 (complete ownership). These results are summarized in Table 2. The old man (experimenter) retained most of the ownership throughout the DG and Person 1 (dictator) had the second most, depending on the stage of the game. We entered ownership ratings for each character into separate ANOVAs as dependent variables with the time of interruption as the independent variable in each. There was a significant effect of interruption time in all three ANOVAs, $F(3, 194) = 10.32$ for old man, $F(3, 195) = 12.27$ for Person 1, and $F(3, 191) = 6.45$ for Person 2, all $ps < .001$. Tukey (HSD) post hoc tests revealed significant differences between interruptions 1 and 2 for both the old man and Person 1, $ps < .001$.

We were interested in whether subjects represented ownership as exclusive to one individual at a time or shared among multiple individuals. If ownership were exclusive, then we would expect to find one character (the owner) with high ownership ratings and both the remaining characters (non-owners) with low ratings. Person 2 (receiver) had low ownership ratings at all stages of the DG, so we decided that the most interesting changes in ownership were between the old man (experimenter) and Person 1 (dictator). Following this logic, we created a measure of ownership exclusivity between old man and Person 1 by taking the absolute value of the difference between their ownership ratings from each subject. For example, if a subject rated the old man's ownership at 6

and Person 1's ownership at 4, then the ownership exclusivity value would be 2 for that subject. We entered these values as a dependent variable into an ANOVA with time of interruption as the independent variable. If ownership were exclusive, then we would expect the difference to be large and to remain the same throughout the DG. The ANOVA showed that differences in ownership changed during the game $F(3, 197) = 12.34, p < .001$.

We also calculated the average number of eggs allocated by subjects to each of the three characters in the story, after each interruption. See Table 3 for a summary of these results. Because changes in subjects' judgment of ownership and cues that might influence ownership mainly involved the old man and Person 1 (almost no one said Person 2 was the owner and allocations to Person 2 were the lowest), we chose to focus on the transfer of ownership from old man to Person 1. Because allocation amounts were not independent (amounts had to sum to 10), we only entered the allocation of eggs to old man as the dependent variable into an ANOVA with time of interruption as the independent variable. There was a significant effect of interruption time, $F(3, 197) = 12.97, p < .001$. Tukey (HSD) post hoc tests revealed a significant difference between interruption 1 and interruption 2, $p < .001$.

Ownership decisions (who is the owner) and allocation decisions (how many eggs each character should keep after the DG is interrupted) were strongly associated. We entered the ownership decisions as an independent variable and allocation to the old man as dependent variable in an ANOVA, which showed a significant effect of ownership decision, $F(2, 197) = 96.59, p < .001$. We also split the allocation data into

two groups: allocations made to characters who were judged to be owners and allocations made to characters who were not judged to be owners. For each allocation decision, there was one owner and two non-owners. We averaged the non-owner allocations in each case so the owner and non-owner groups had the same number of data points. Then we used a *t*-test to show that subjects allocated significantly more eggs to owners than non-owners. The results of this test and others can be seen in Table 6.

Subjects rated on a scale of 1-7 how morally wrong they thought it would be if each character kept all the eggs (the endowment) after the DG was interrupted from 1 (not morally wrong at all) to 7 (totally morally wrong). These results are summarized in Table 4. For each character (old man, Person 1, Person 2), we entered wrongness ratings into an ANOVA as the dependent variable and interruption time as the independent variable. There was a significant effect of interruption time for the old man, $F(3, 197) = 4.61, p < .01$. Post hoc Tukey (HSD) tests revealed that the only significant difference was between interruption 1 and 4, $p < .01$. The results were not significant for Person 1, $F(3, 197) = 2.25, p = .08$ or for Person 2, $F(3, 196) = 1.28, p = .28$.

Subjects rated on a scale of 1-7 how unfair they thought it would be if each character kept all the eggs (the endowment) after the DG was interrupted from 1 (not unfair at all) to 7 (totally unfair). These results are summarized in Table 5. For each character (old man, Person 1, Person 2), we entered unfairness ratings into an ANOVA as the dependent variable and interruption time as the independent variable. There was a significant effect of interruption time for the old man, $F(3, 197) = 8.59, p < .001$. Post

hoc Tukey (HSD) tests revealed that the effect was driven by a significant difference between interruption 4 and all other interruptions, $ps < .02$. The results were not significant for Person 1, $F(3, 196) = 1.96, p = .12$ or for Person 2, $F(3, 196) = 0.39, p = .76$.

Both the moral wrongness and unfairness of keeping the entire endowment were negatively correlated with judgment of ownership. We performed a *t*-test, comparing the moral wrongness ratings between the two groups “keeper is owner” and “keeper is not owner.” That is, one group comprised the moral wrongness ratings of characters whom the subjects judged to be owners. In the other group, we entered the moral wrongness ratings of characters whom subjects did not judge to be owners. We averaged the two non-owner ratings as described above so that the two groups would have the same number of data points. We performed this same procedure with the unfairness ratings. Subjects rated that it was less unfair and less morally wrong for owners, as opposed to non-owners, to keep the entire endowment. See Table 6 for a summary of the results.

Experiment 2

We hypothesized that when the dictator works for the endowment, there is a legitimate transfer of property rights and ownership from the experimenter to the dictator. In Experiment 2, we examined how this transfer would affect judgments of ownership, wrongness, and fairness, as well as allocation decisions. We predicted that after Person 1 worked for the endowment, subjects would judge Person 1 to own the

endowment more, allocate more of the endowment to Person 1, and judge it to be less wrong and unfair for Person 1 to keep all of the endowment.

Method

Design

Subjects read a story analogous to the DG. We used the same story and images as in Experiment 1 but with a key difference. Rather than simply handing box 1 with 10 eggs to Person 1 to make an allocation decision, the old man first asks Person 1 to retrieve firewood from outside the house. For each piece of wood that Person 1 brings into the house, the old man puts one egg into box 1 until Person 1 has retrieved ten pieces of wood and the old man has put 10 eggs into box 1. Then the story proceeds exactly as in Experiment 1 (see Appendix B for full story). Subjects first read how The Meeting normally went, that is when the DG was played to completion. Next subjects read one of several different accounts of when the game was interrupted at a key moment because lightning struck the old man's house. Elimination procedures were the same as in Experiment 1. We chose the following points at which to introduce an interruption: 1) just before the Old Man entered the room with Person 1 (no work is done yet), 2) just before Person 1 made a decision (after work was done), and 3) just after Person 1 made a decision (we did not specify what the decision was).

Subjects Materials and Procedures

159 subjects from the United States, among them 87 women, 72 men, were recruited from Amazon Mechanical Turk. Ages ranged from 18 to 67, $M = 33.23$, $SD = 13.02$.

Subjects were randomly assigned to each of the experimental conditions. The materials and procedures were the same as Experiment 1 and differed only in the scenario stimuli.

Results

We first tabulated ownership decisions. These results are summarized in Table 7. The difference among conditions was significant, $\chi^2(4) = 54.91, p < .001$. The key difference was between conditions 1 and 2 because after interruption 1, Person 1 has not yet worked but after interruption 2, he has worked for the endowment. The difference between conditions 1 and 2 was significant $\chi^2(1) = 43.44, p < .001$ (df was 1 because Person 2 cells contained 0 and were not included) while the difference between 2 and 3 was not significant $\chi^2(2) = 1.03, p = .60$. In Experiment 1, the majority of subjects said the old man (experimenter) was the owner throughout the entire game whereas in Experiment 2, after Person 1 (dictator) worked for the endowment, most subjects said Person 1 is the owner.

Subjects rated to what extent they believed each character owned the eggs after the DG was interrupted, from 1 (no ownership) to 7 (complete ownership). These results are summarized in Table 8. After Person 1 worked for the endowment, subjects on average judged him to own it more than the old man. The extent to which ownership is shared is demonstrated by almost no difference between the mean ratings of old man and Person 1 ownership after interruption 2. For each character (old man, Person 1, Person 2), we entered ownership ratings into an ANOVA as the dependent variable and interruption time as the independent variable. There was a significant effect of

interruption time for all three ANOVAs $F(2, 158) = 39.58, p < .001$ for old man, $F(2, 158) = 46.60, p < .001$ for Person 1, and $F(2, 155) = 7.94, p = .001$ for Person 2. Tukey (HSD) post hoc tests revealed significant differences between interruptions 1 and 2 for both the old man and Person 1, $ps < .001$. The difference between interruptions 2 and 3 was significant for the old man, $p = .04$, and for Person 2, $p = .001$.

We also calculated the average number of eggs allocated by subjects to each of the three characters in the story, for each condition. See Table 9 for a summary of these results. Based on the same reasoning in Experiment 1, the allocations to the old man were entered as the dependent variable into an ANOVA with interruption time as the independent variable. There was a significant effect of interruption time, $F(2, 159) = 33.79, p < .001$. Post-hoc tests (Tukey HSD) showed a significant difference between interruptions 1 and 2, $p < .001$ and between interruptions 2 and 3, $p = .05$.

Ownership decisions and allocation decisions were strongly associated. We entered the ownership decisions as independent variable and allocation to the old man as dependent variable in an ANOVA, which showed a significant effect of ownership decision, $F(2, 159) = 88.34, p < .001$. We also split the allocation data into two groups (owners and non-owners) as explained in Experiment 1 and conducted a *t*-test which showed that subjects allocated significantly more eggs to owners than non-owners. The results of this test and others are shown in Table 10.

Subjects rated on a scale of 1-7 how unfair and how morally wrong they thought it would be if each character kept all the eggs after the DG was interrupted. These results are summarized in Table 11. Both the moral wrongness and unfairness of keeping the

entire endowment were negatively correlated with judgment of ownership. Unlike in Experiment 1, Person 1 (dictator) received about the same or lower unfairness/wrongness ratings compared to old man (experimenter) for keeping the endowment after interruptions 2 and 3. This is because after interruptions 2 and 3, Person 1 has worked for the endowment. As in Experiment 1, we compared subjects' ratings of wrongness and unfairness across two groups: When the keeper of the endowment is the owner versus non-owner. See Table 10 for results of *t*-tests. Subjects rated that it was less unfair and less morally wrong for owners to keep the entire endowment than for non-owners to keep it.

Discussion

Our main findings suggest that ownership influences decisions in the DG. In both experiments, subjects chose to allocate more of the endowment to those they judged to be owners rather than non-owners. Subjects also rated that it was less unfair and less morally wrong for owners, rather than non-owners, to keep the entire endowment.

Explicit rules or norms did not appear to influence judgments of ownership. All subjects were aware of the normal rules of the DG, including the usual ability of the dictator to allocate the endowment and the fact that the experimenter never kept anything. Yet in Experiment 1, an examination of the canonical DG, subjects responded that the experimenter owned the endowment the most, throughout the entire game. These findings suggest that the explicit instructions subjects receive in the canonical DG might not cause a representation of a legitimate transfer of ownership.

Cues on the other hand, seemed to play an important role in judgments of ownership. Despite having no explicit statements in the instructions about ownership, subjects had no trouble spontaneously inferring owners. As predicted, the experimenter received the highest ownership ratings earliest in the DG. This finding makes sense, if being the first possessor of something confers ownership of it. The allocating and working for the endowment also shifted ownership judgments. In Experiment 1, the ownership ratings for the dictator increased around the moment of allocation. In Experiment 2, when the dictator worked for the endowment, we observed a shift of the highest ownership ratings and allocations from experimenter to dictator.

Ownership was not always exclusive and clear, but rather shared and ambiguous. In the forced choice measure, a significant proportion of subjects disagreed as to whether the experimenter or the dictator was the owner. This proportion changed throughout the DG, according to environmental cues. In addition, when asked to rate the extent of ownership, subjects' ratings changed throughout the game, at one point reaching almost identical ratings for experimenter and dictator.

These findings have implications for both DG research and cognitive research about ownership and property rights. Economists who focus on explaining why dictators give any of the endowment away might benefit from understanding the relationship between ownership and concepts of fairness, moral wrongness and altruism. It could be the case that because dictators don't infer legitimate ownership of the endowment, it does not feel morally right or fair to keep it all, and so they give some away. If ownership were clearer, giving might decrease.

Research on the cognition that leads to ownership inferences might benefit from further exploring which environmental cues shift people's judgments the most. We hope future work will examine cues like trading for, finding, receiving as a gift, needing more than others, receiving more benefit from, creating, and others. In addition, exactly how multiple cues interact, leading to final determinations of who owns what, is still a mystery.

Of course, these findings have limitations. It is unclear to what extent we can predict behavior in real DGs, or real world situations for that matter, from subjects' responses to vignettes about the DG. In addition, explorations into the cognition of ownership on the one hand and the psychology of phenomena like altruism, selfishness, wrongness and fairness on the other, might be better carried out as separate endeavors.

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Table 1

% of Subjects who Said Each Character Was the Owner

Interruption	<i>n</i>	Old Man	Person 1	Person 2
1-Before old man entered room 1	54	94%	6%	0%
2-Before Person 1 made a decision	49	61%	39%	0%
3-After Person 1 made a decision	47	74%	26%	0%
4-Before old man gave box 2 to Person 2	47	68%	21%	11%

Table 2

Mean(SD) Rating From 1-7 of Ownership

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	6.63(1.25)	1.48(1.46)	1.13(.70)
2-Before Person 1 made a decision	4.81(2.45)	3.60(2.56)	1.58(1.50)
3-After Person 1 made a decision	5.28(2.31)	2.96(2.13)	1.76(1.40)
4-Before old man gave box 2 to Person 2	4.47(2.31)	3.70(2.19)	2.36(1.89)

Table 3

Mean (SD) Eggs Allocated by Subjects to Each Character

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	9.15(2.74)	0.66(2.2)	0.20(.96)
2-Before Person 1 made a decision	5.14(4.76)	3.96(4.29)	0.90(1.77)
3-After Person 1 made a decision	5.64(4.76)	2.87(3.4)	1.49(2.23)
4-Before old man gave box 2 to Person 2	4.47(4.29)	3.46(2.75)	2.15(2.6)

Table 4

Mean Wrongness(SD) Ratings from 1-7 for Keeping All Eggs After Interruption

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	1.65(1.76)	5.43(2.00)	5.68(1.86)
2-Before Person 1 made a decision	2.51(2.14)	4.61(2.12)	5.43(1.90)
3-After Person 1 made a decision	2.11(1.89)	4.51(2.38)	5.23(2.21)
4-Before old man gave box 2 to Person 2	3.15(2.54)	4.43(2.38)	4.89(2.27)

Table 5

Mean Unfairness(SD) Ratings from 1-7 for Keeping All Eggs After Interruption

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	1.61(1.53)	5.49(2.02)	5.89(1.74)
2-Before Person 1 made a decision	2.39(2.03)	4.45(2.29)	5.65(1.80)
3-After Person 1 made a decision	2.45(2.12)	4.85(2.29)	5.77(1.82)
4-Before old man gave box 2 to Person 2	3.72(2.64)	4.87(2.21)	5.51(1.89)

Table 6

Means and t-test results for Allocation, Wrongness, Unfairness. Owners Versus Non-Owners

Measure	Mean For	Mean For	<i>t</i>	<i>p</i>	df
	Owners	Non-Owners			
Allocations (10 eggs)	7.91	1.05	25.47	<.001	392
Moral Wrongness (1-7)	2.09	5.14	15.44	<.001	392
Unfairness (1-7)	2.18	5.46	17.36	<.001	392

Note. All *t* tests were within-subject and two-tailed.

Table 7

% of Subjects who Said Each Character Was the Owner

Interruption	<i>n</i>	Old Man	Person 1	Person 2
1-Before old man entered room 1	49	98%	2%	0%
2-Before Person 1 made a decision	55	36%	64%	0%
3-After Person 1 made a decision	55	34%	64%	2%

Table 8

Mean(SD) Rating From 1-7 of Ownership

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	6.76(1.05)	1.25(1.00)	1.23(0.93)
2-Before Person 1 made a decision	4.18(2.46)	4.31(2.57)	1.07(0.43)
3-After Person 1 made a decision	3.20(2.34)	4.87(2.07)	1.83(1.46)

Table 9

Mean (SD)Eggs Allocated by Subjects to Each Character

Interruption	Old Man	Person 1	Person 2
1-Before old man entered room 1	8.45(3.32)	0.78(1.66)	0.78(1.66)
2-Before Person 1 made a decision	4.04(4.55)	4.45(3.87)	1.51(2.18)
3-After Person 1 made a decision	2.27(3.70)	6.16(3.64)	1.56(2.31)

Table 10

Means and t-test results for Allocation, Wrongness, and Unfairness. Owners Versus Non-Owners

Comparison	Mean for		<i>t</i>	<i>p</i>	df
	Owners	Non-Owners			
Allocations (10 eggs)	7.61	1.19	21.168	<.001	316
Moral Wrongness (1-7)	2.08	5.30	15.179	<.001	316
Unfairness (1-7)	2.26	5.48	14.998	<.001	316

Note. All *t* tests were within-subject and two-tailed.

Table 11

Mean Wrongness and Unfairness Ratings from 1-7 for Keeping All Eggs After Interruption

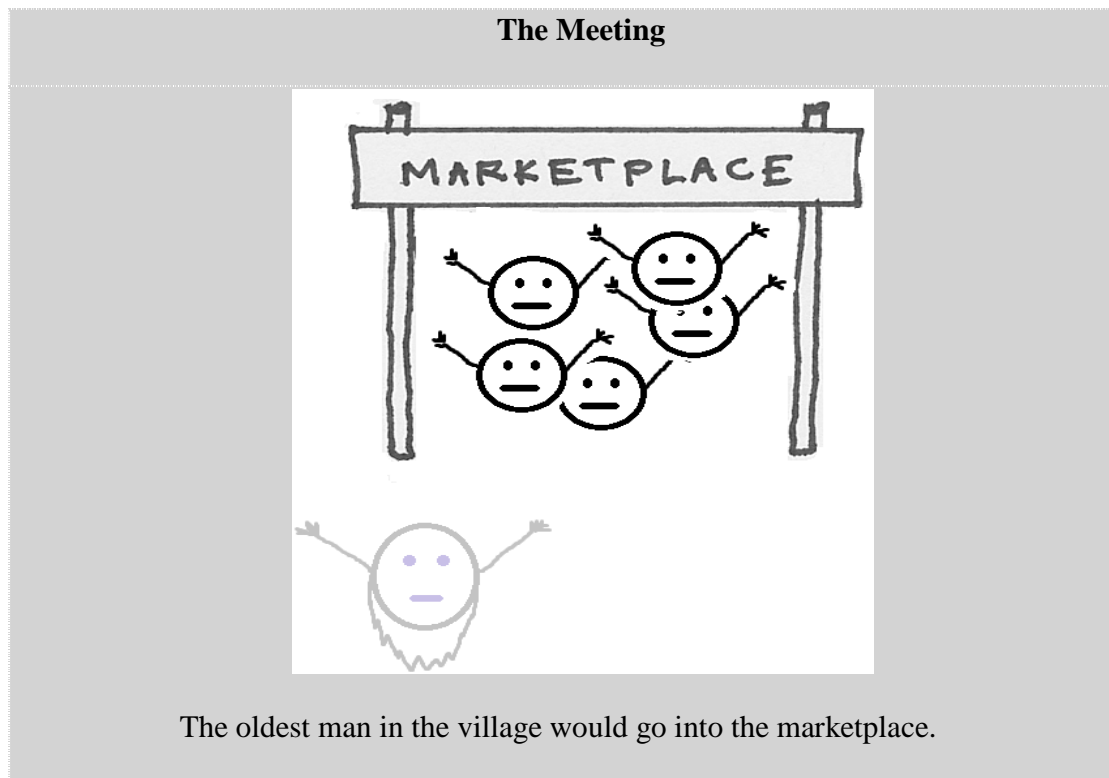
Interruption	Old Man		Person 1		Person 2	
	W	U	W	U	W	U
1-Before old man entered room 1	1.24	1.22	5.81	6.08	5.85	6.00
2-Before Person 1 made a decision	3.47	3.89	3.82	4.07	5.73	6.02
3-After Person 1 made a decision	3.71	3.87	3.27	3.02	5.33	5.60

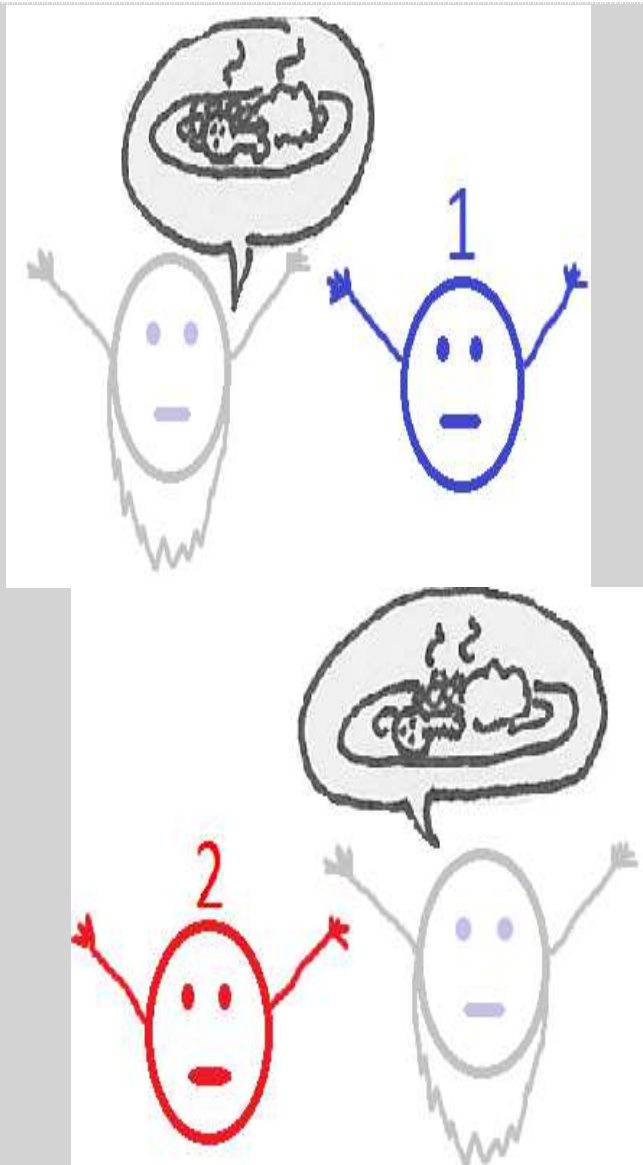
Note. W = Wrongness and U = Unfairness.

Appendix A: Stimuli for Experiment 1

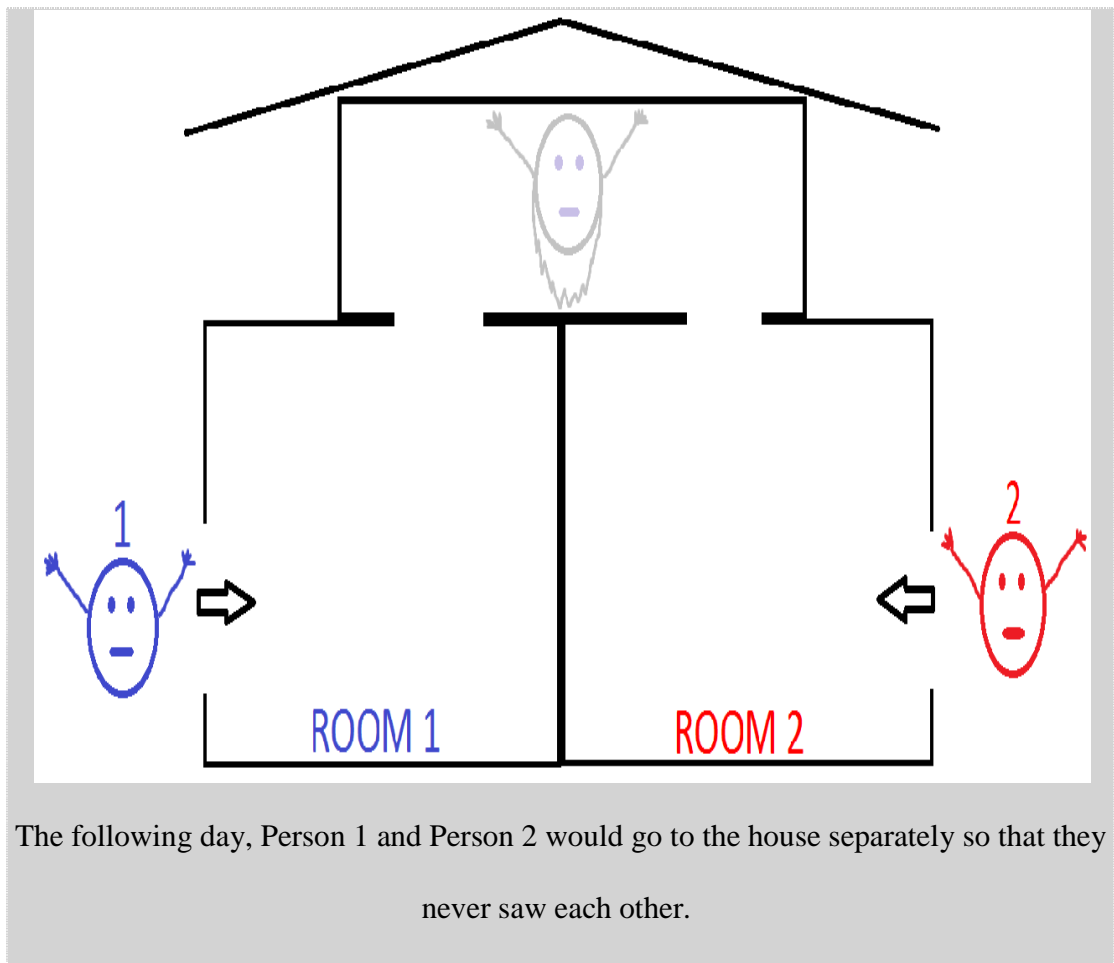
Part I: Description of The Meeting

During medieval times, there was a custom called The Meeting, which was performed every year. The Meeting normally went as follows:

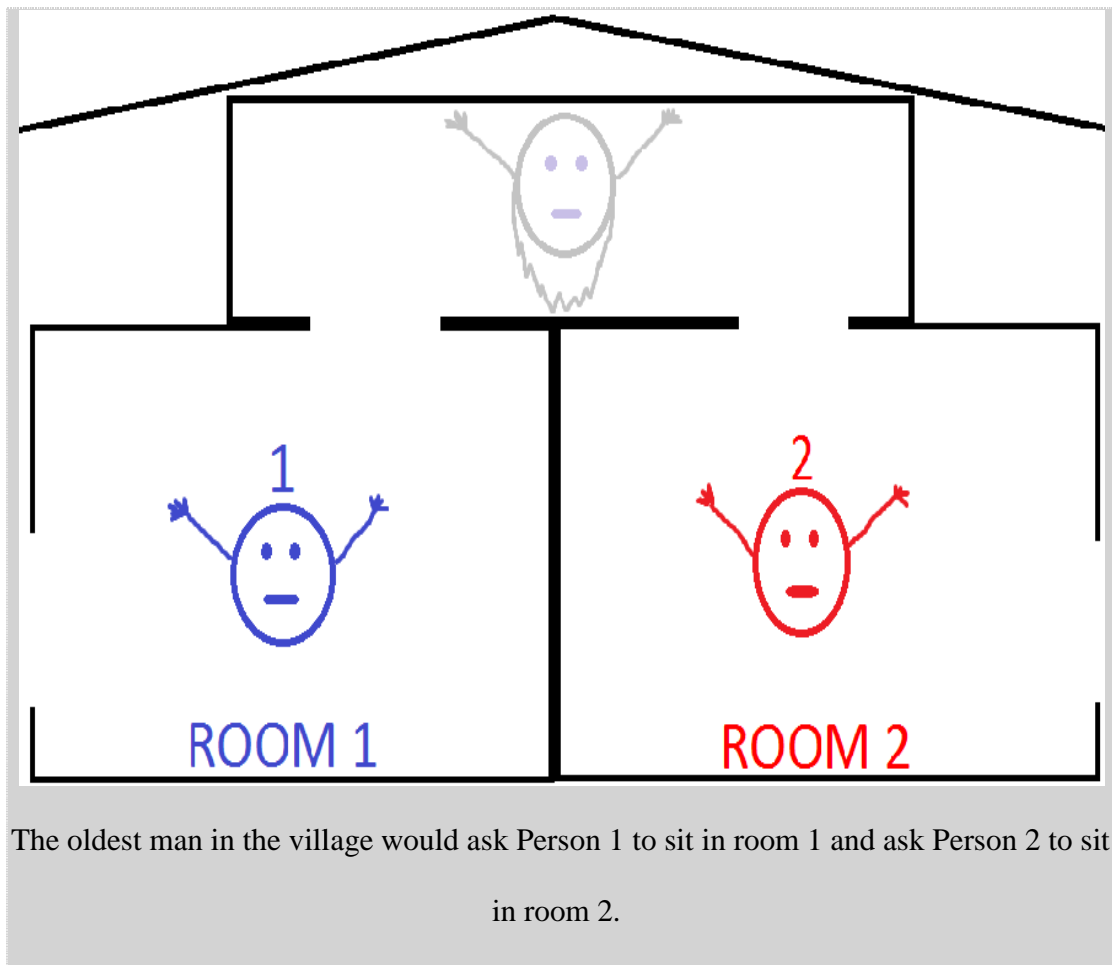




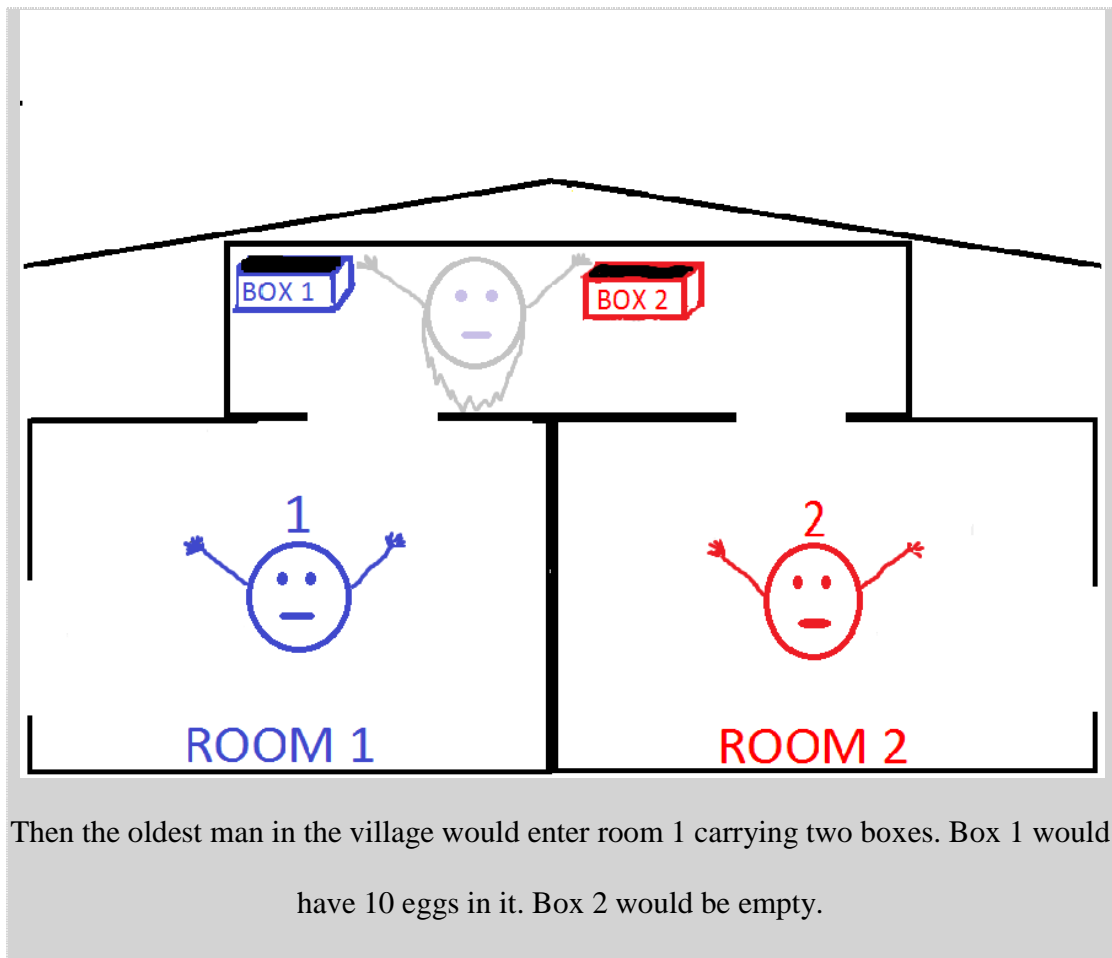
He would randomly select two people who did not know each other (we can call them Person 1 and Person 2). He would approach each individually to preserve their anonymity and say, "I would like you to come to my house tomorrow and spend some time with me. I will give you a free meal just for showing up."



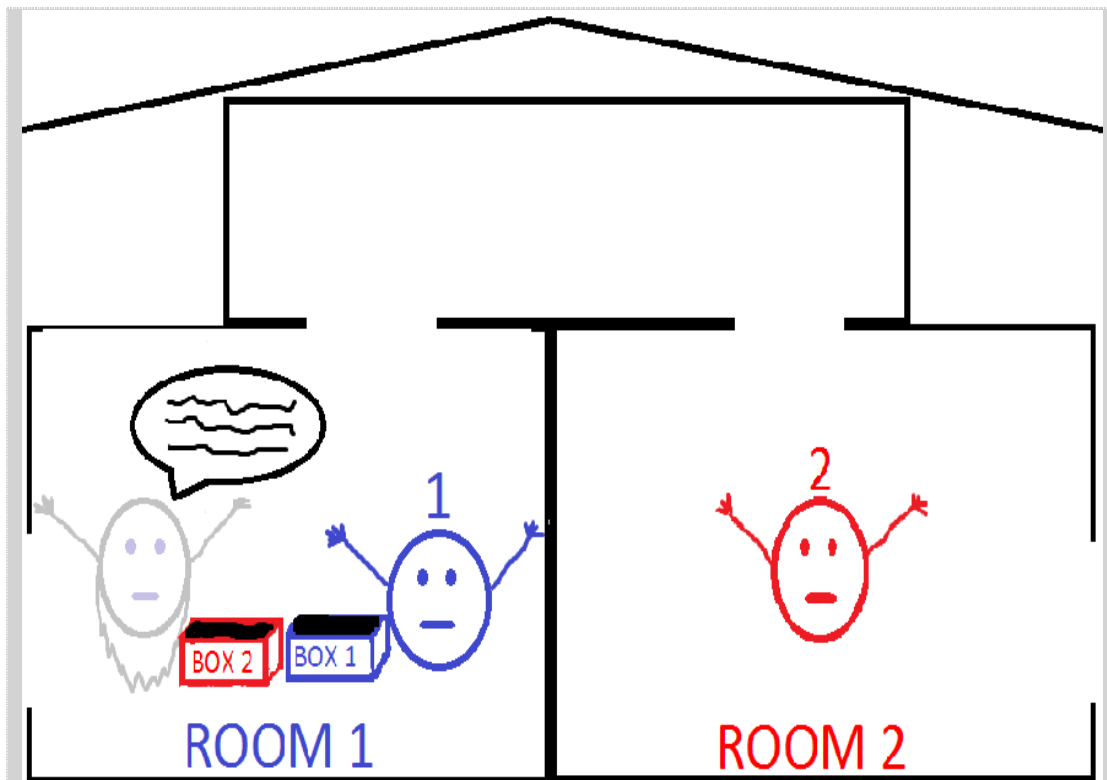
The following day, Person 1 and Person 2 would go to the house separately so that they never saw each other.



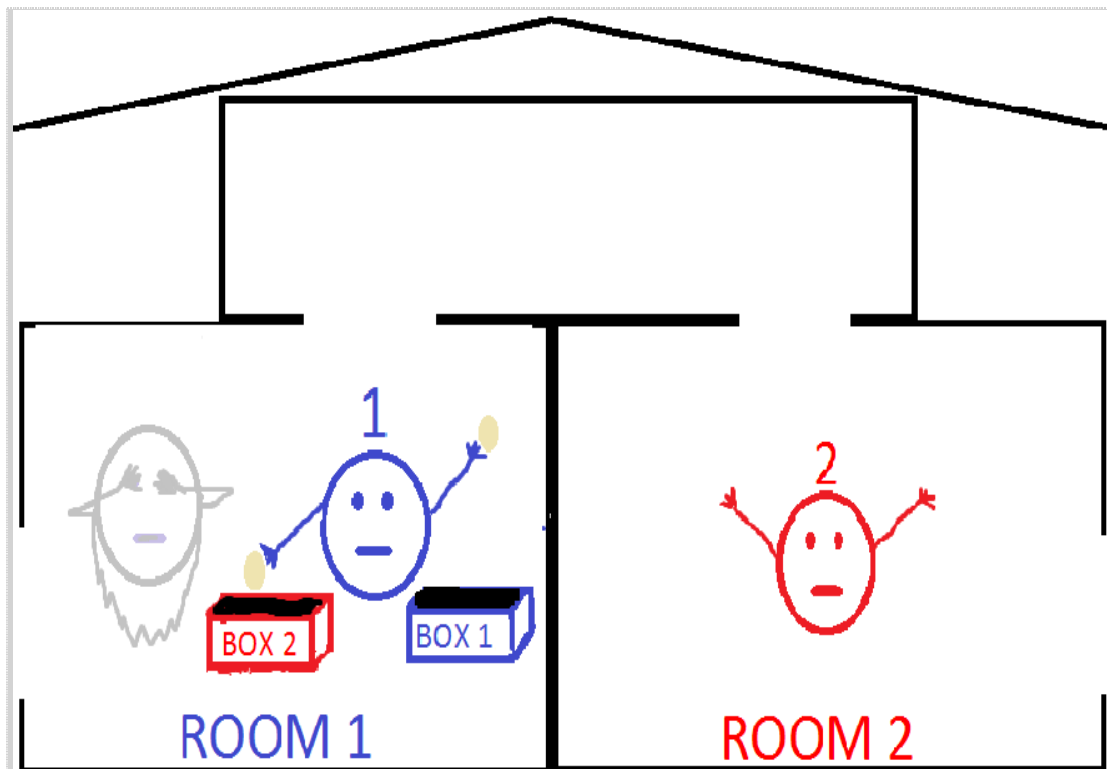
The oldest man in the village would ask Person 1 to sit in room 1 and ask Person 2 to sit in room 2.



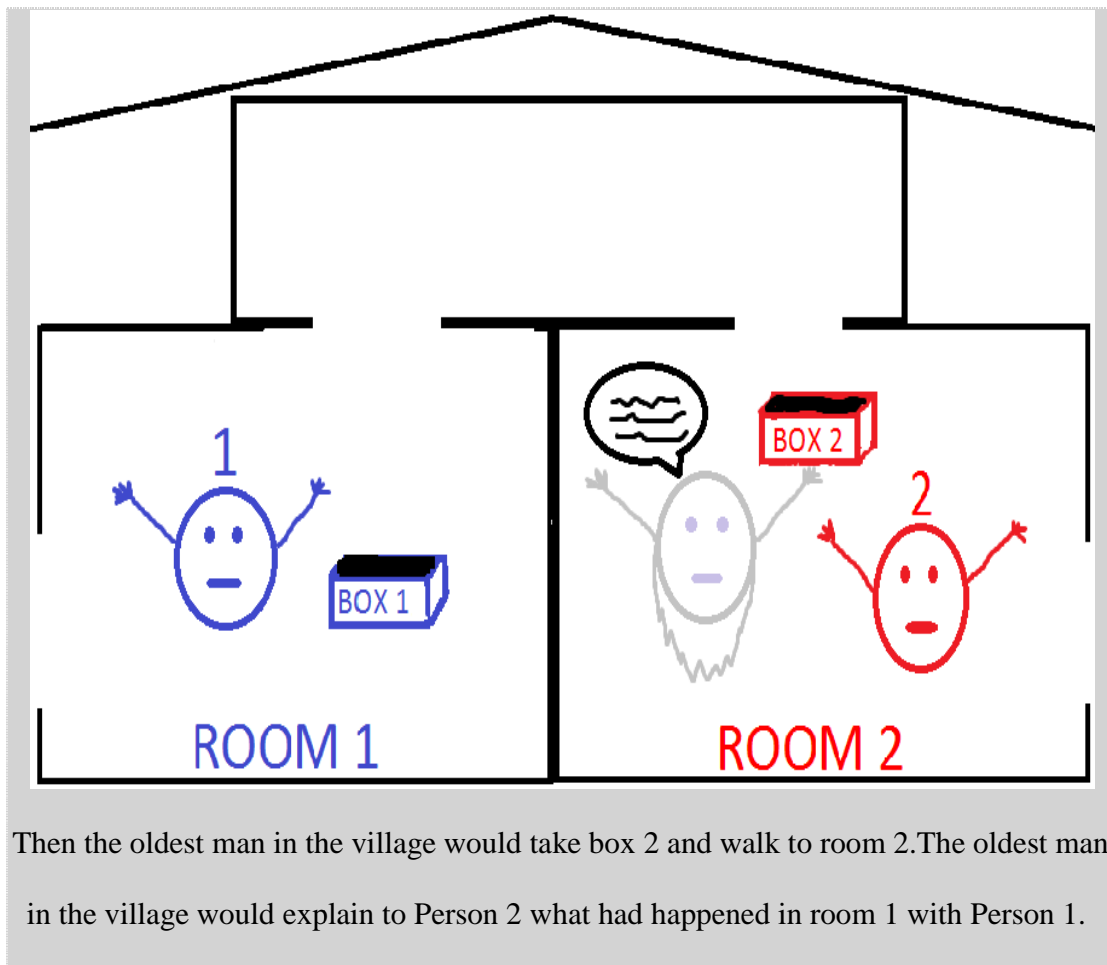
Then the oldest man in the village would enter room 1 carrying two boxes. Box 1 would have 10 eggs in it. Box 2 would be empty.

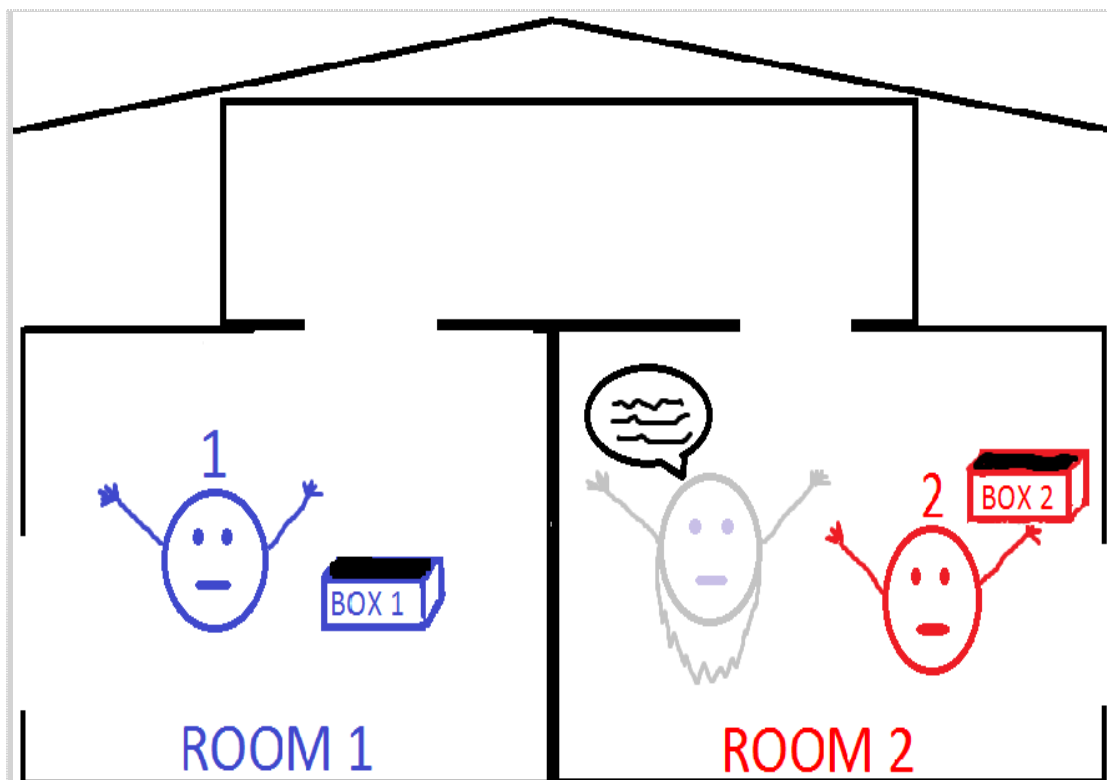


The oldest man in the village would place box 1 and box 2 before Person 1. The oldest man in the village would say, "You may choose to put any number of eggs, from 0 to 10, from box 1 into box 2. I will then take box 2 and give it to another person who I invited to the house today and explain to that person what happened. I will not tell anyone your identity. After you make your decision, I will not look inside either box so I will not know what your decision was. Afterwards, you may have your free meal and then you may leave with box 1, containing whatever number of eggs you chose to keep for yourself. I will now cover my eyes so you can make your decision."

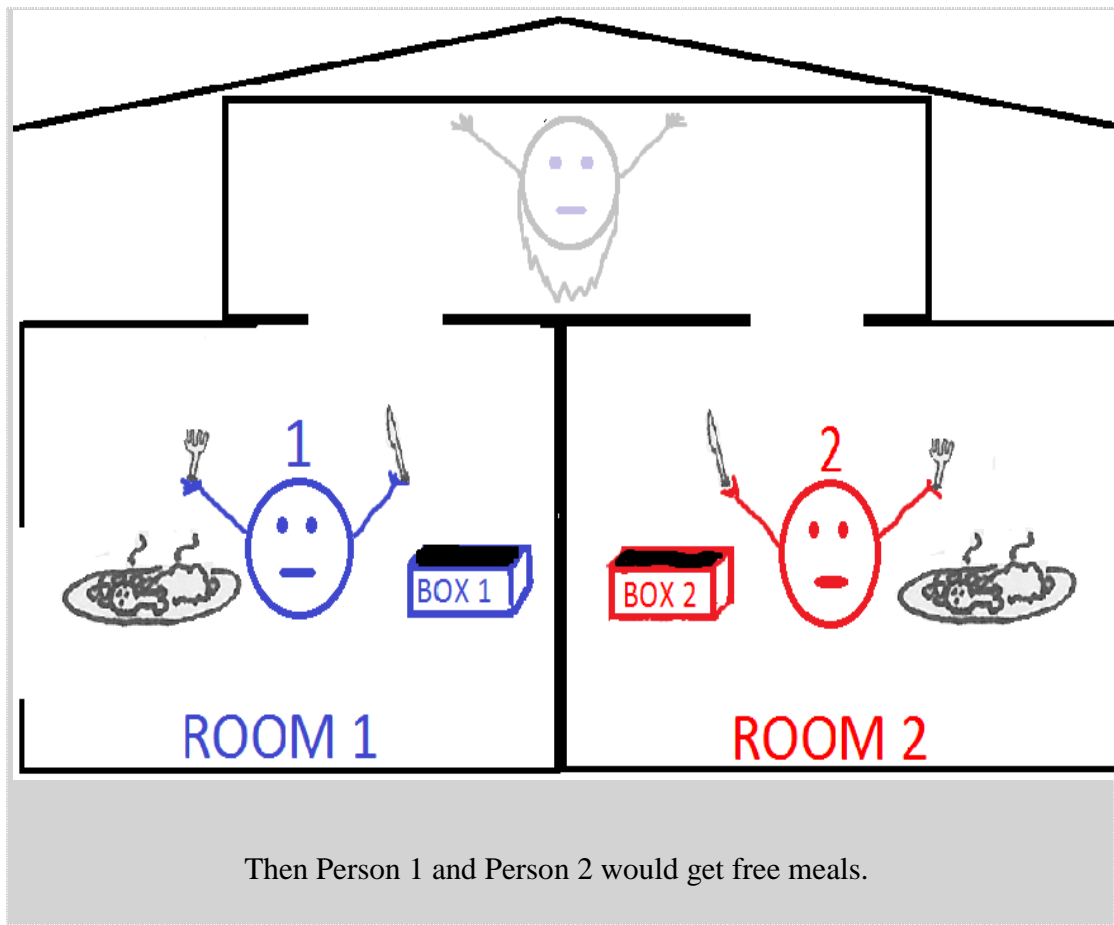


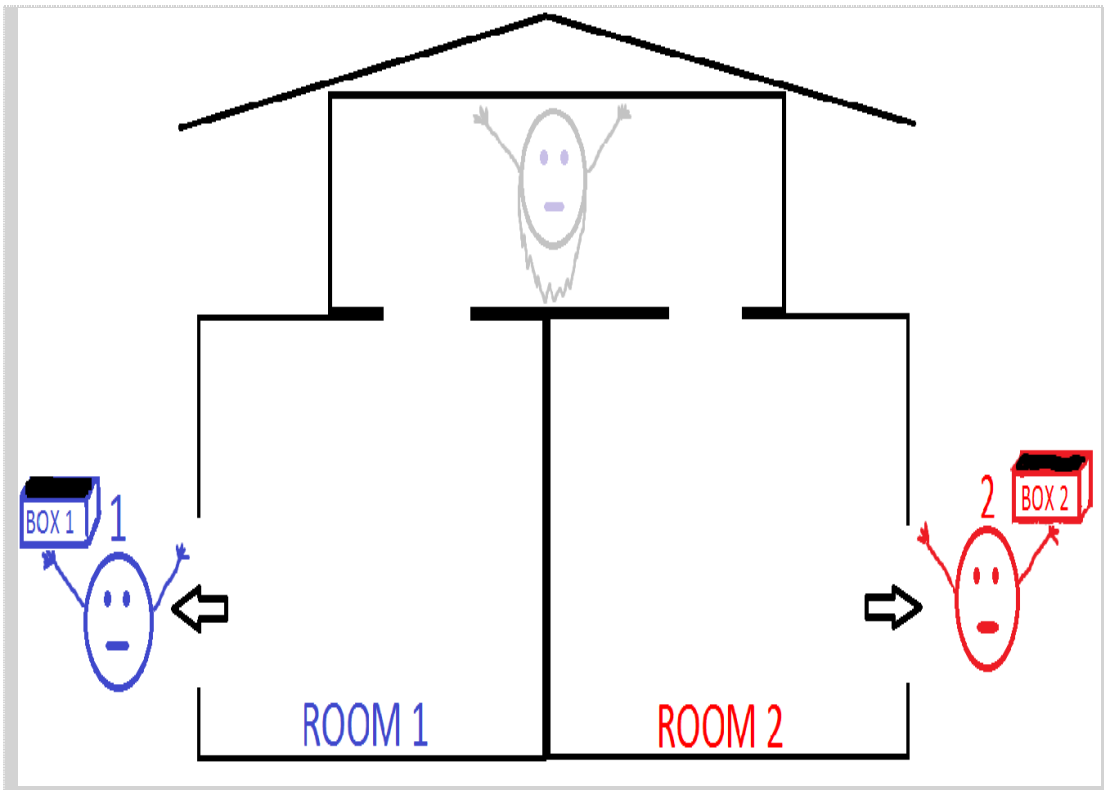
Then the oldest man in the village would cover his eyes so he didn't see what Person 1 was doing. Person 1 would put whatever number of eggs he wished to put into box 2.





The oldest man in the village would then give box 2 to Person 2 without looking inside it. Then he would say, "You may take this box with you when you leave. You may now have your free meal and leave when you are finished."





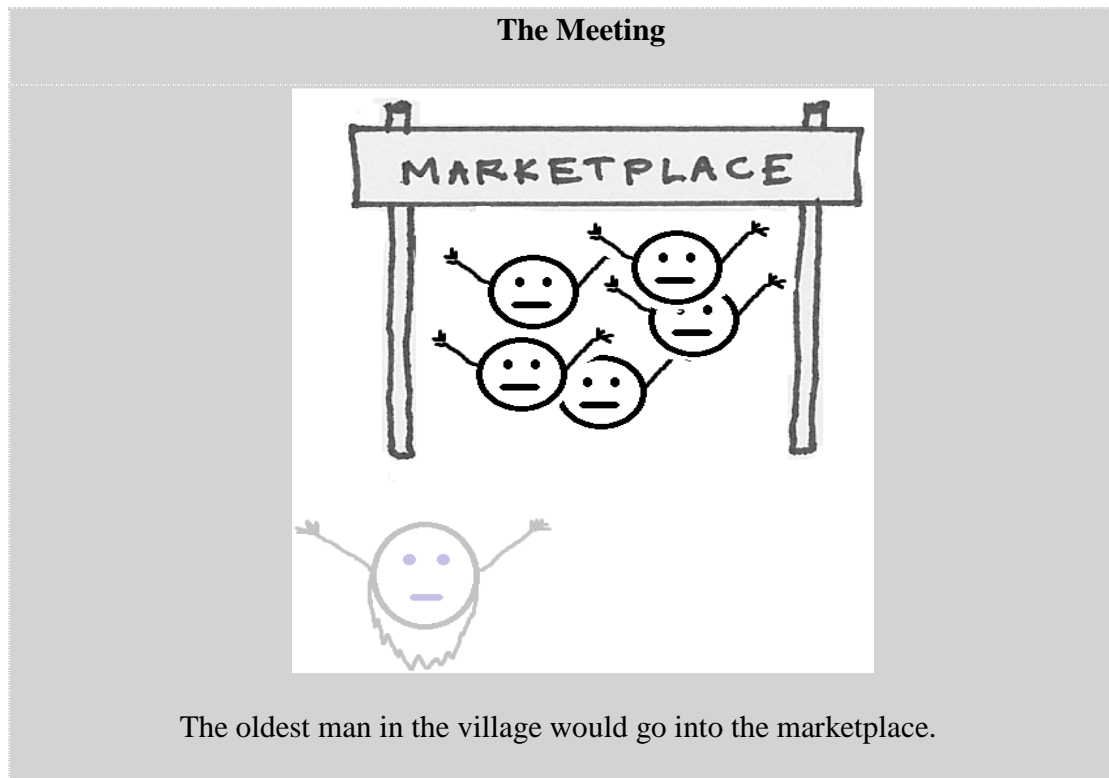
Then Person 1 would leave with box 1 and Person 2 would leave with box 2.

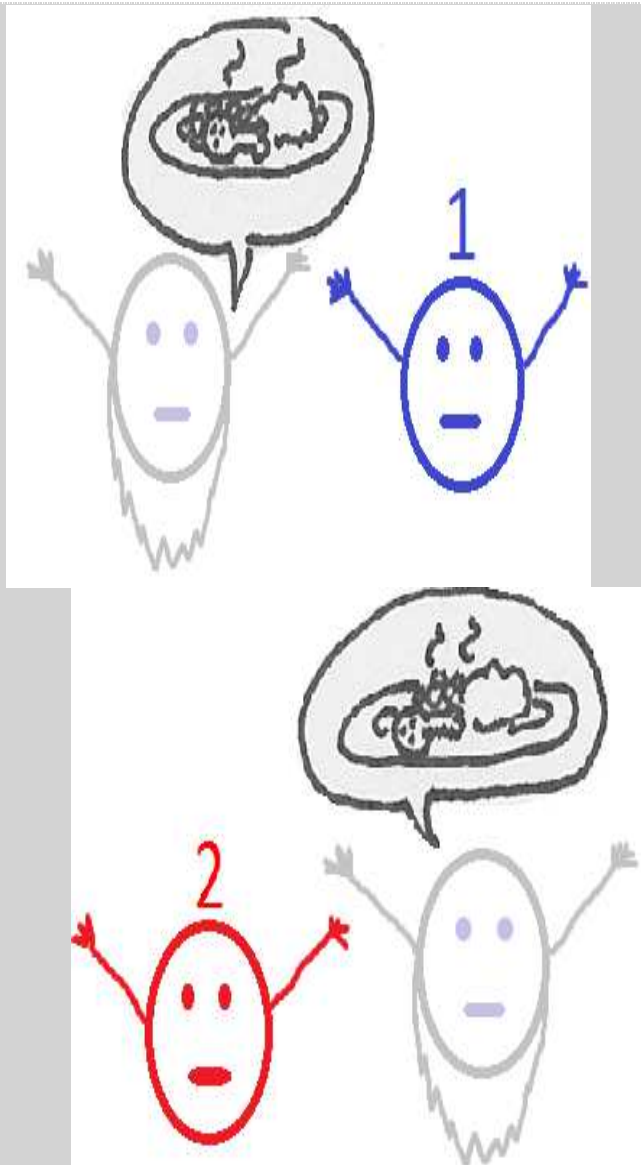
This happened every year and was called The Meeting.

Appendix B: Stimuli for Experiment 2

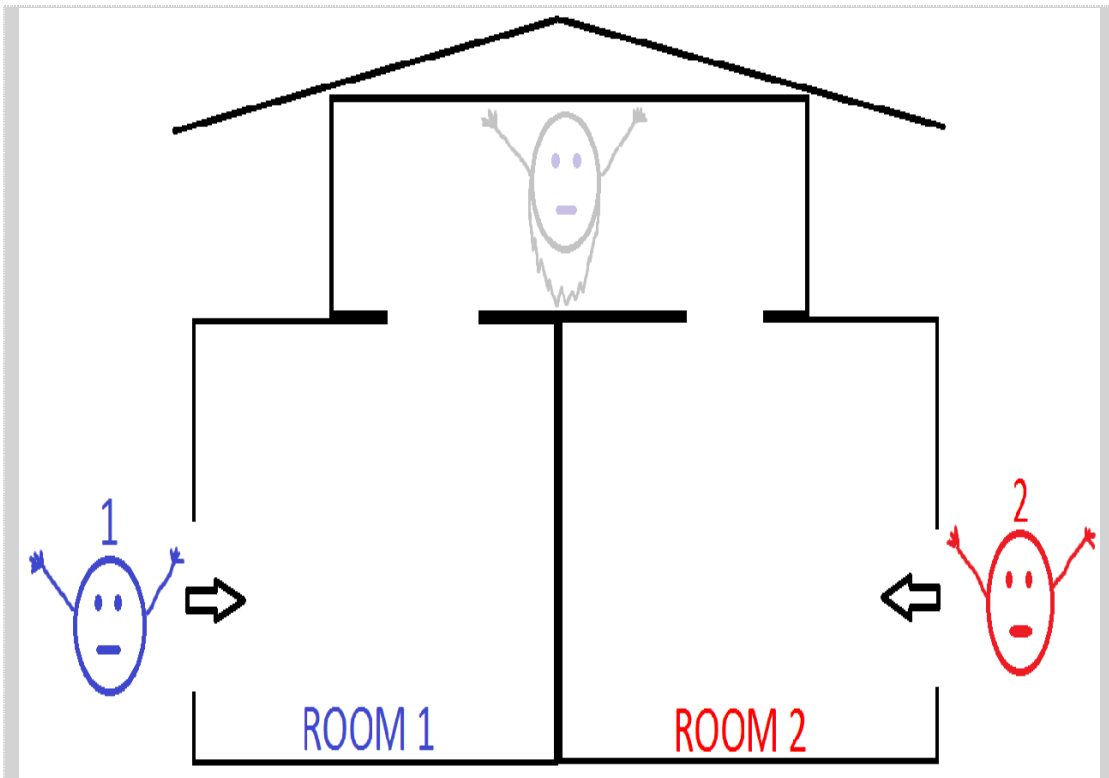
Part I: Description of The Meeting

During medieval times, there was a custom called The Meeting, which was performed every year. The Meeting normally went as follows:

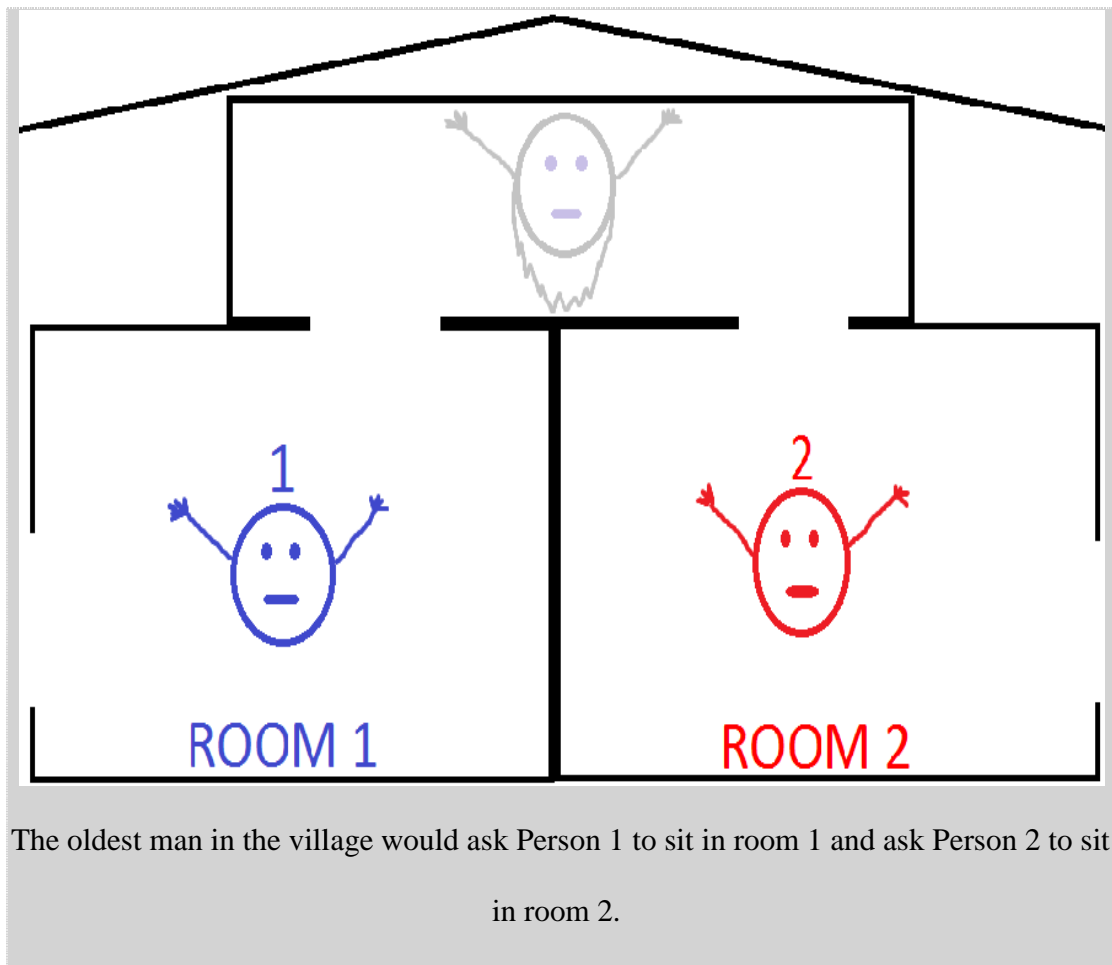


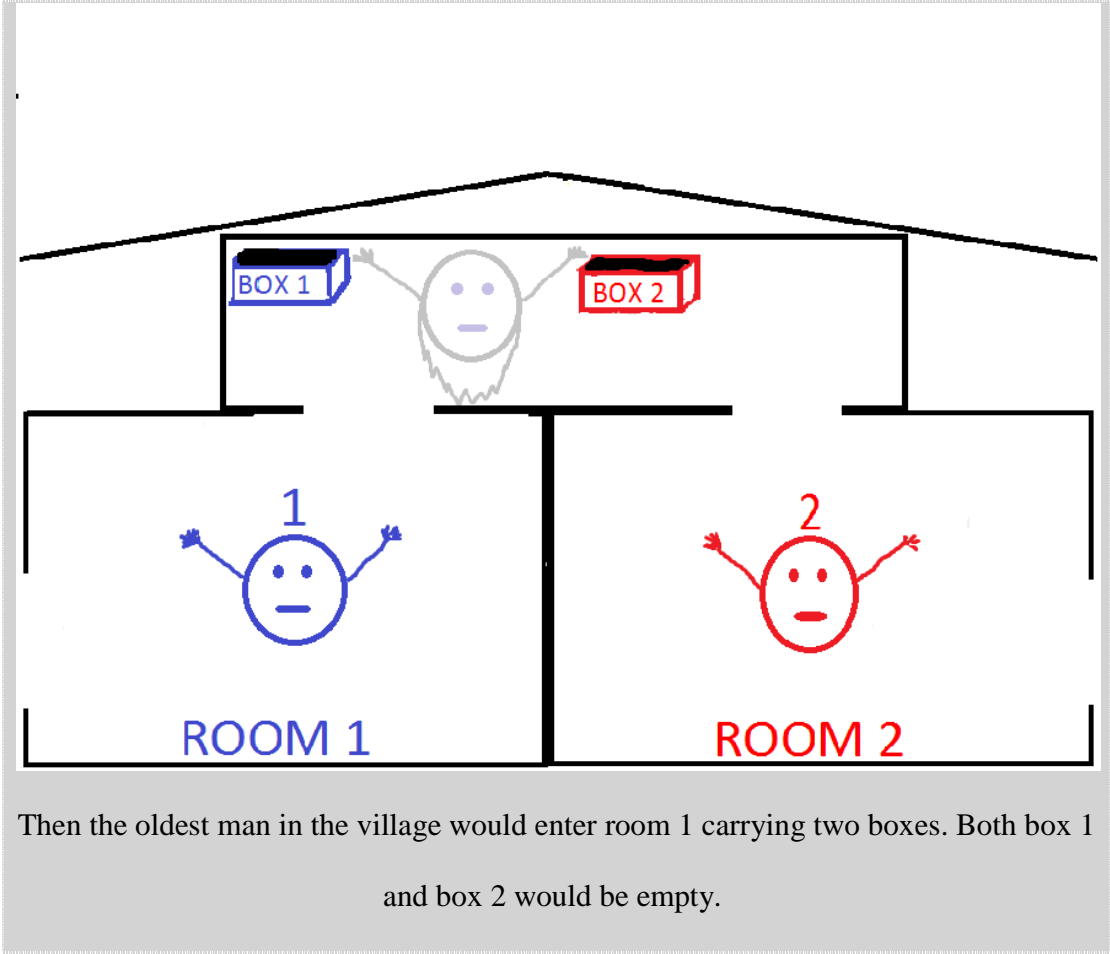


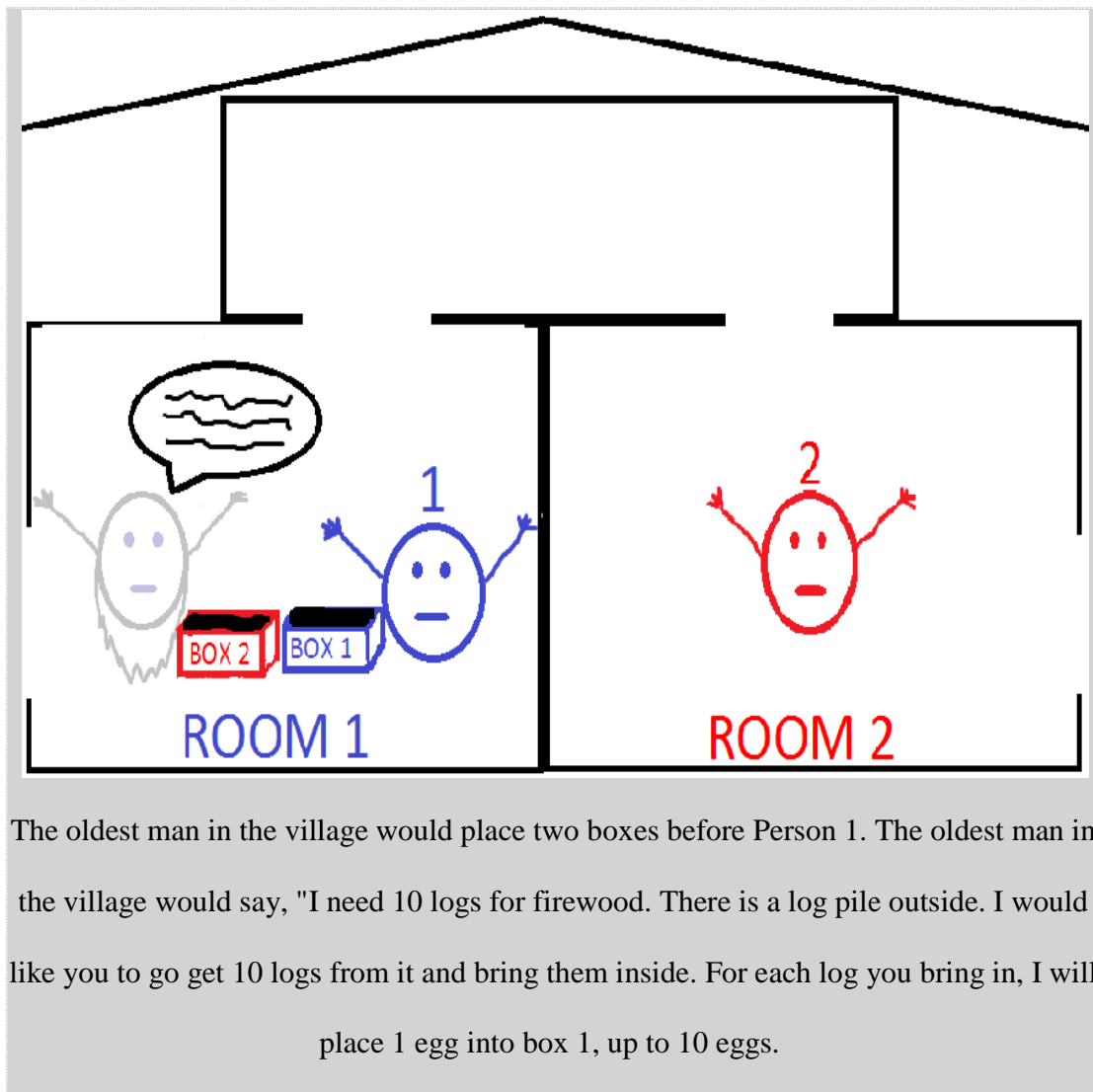
He would randomly select two people who did not know each other (we can call them Person 1 and Person 2). He would approach each individually to preserve their anonymity and say, "I would like you to come to my house tomorrow and spend some time with me. I will give you a free meal just for showing up."



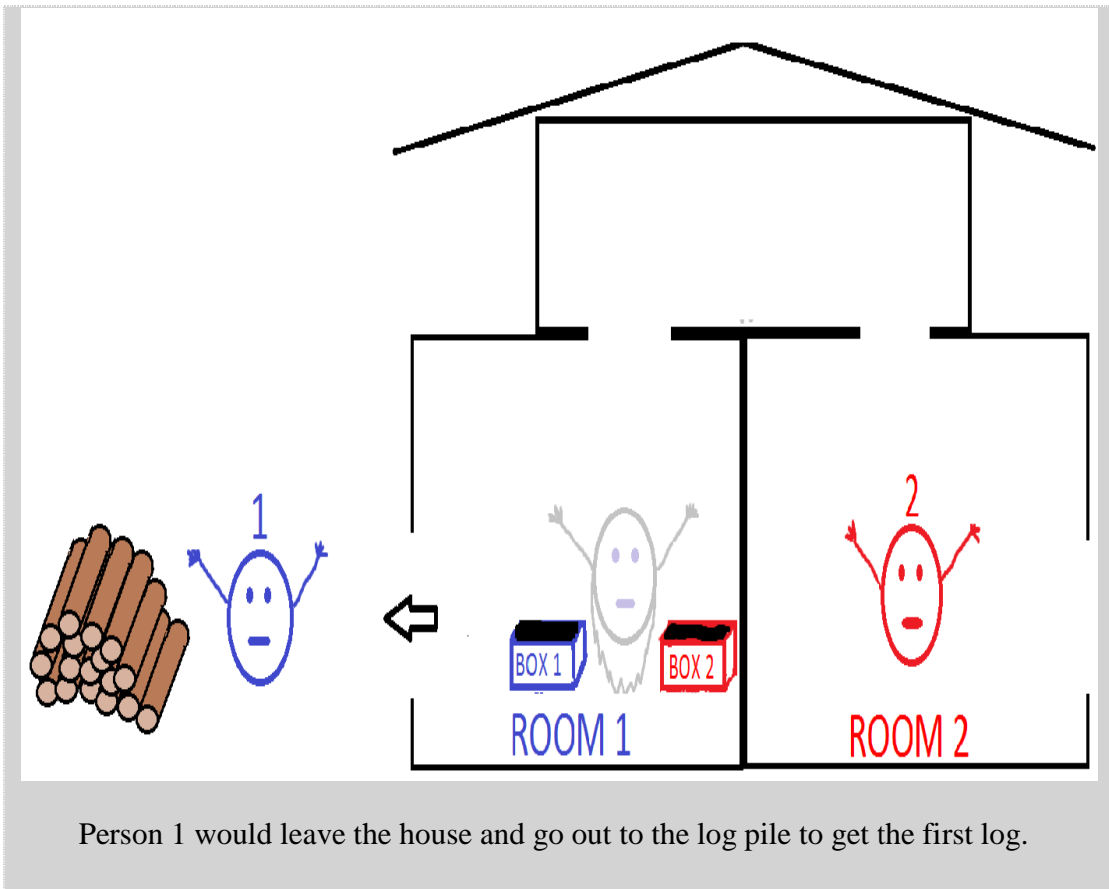
The following day, Person 1 and Person 2 would go to the house separately so that they never saw each other.

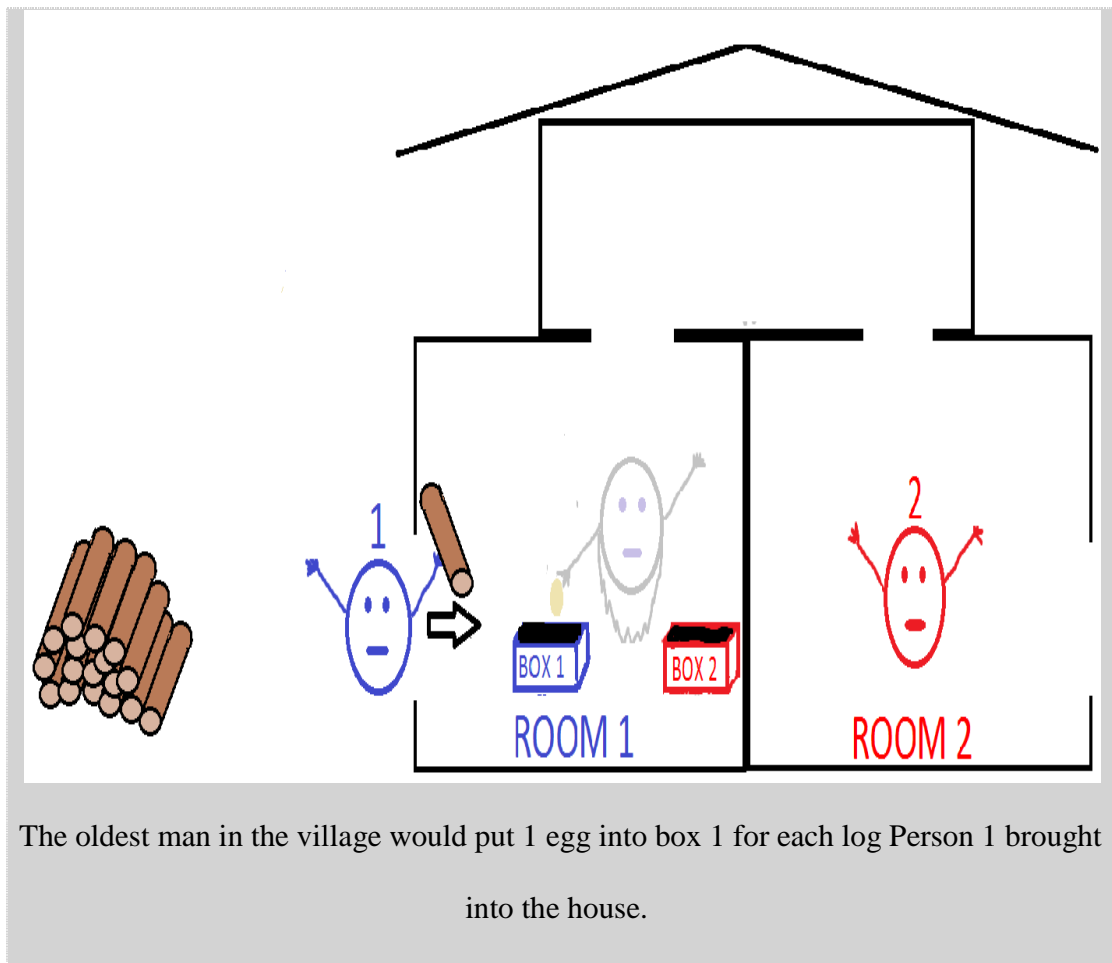


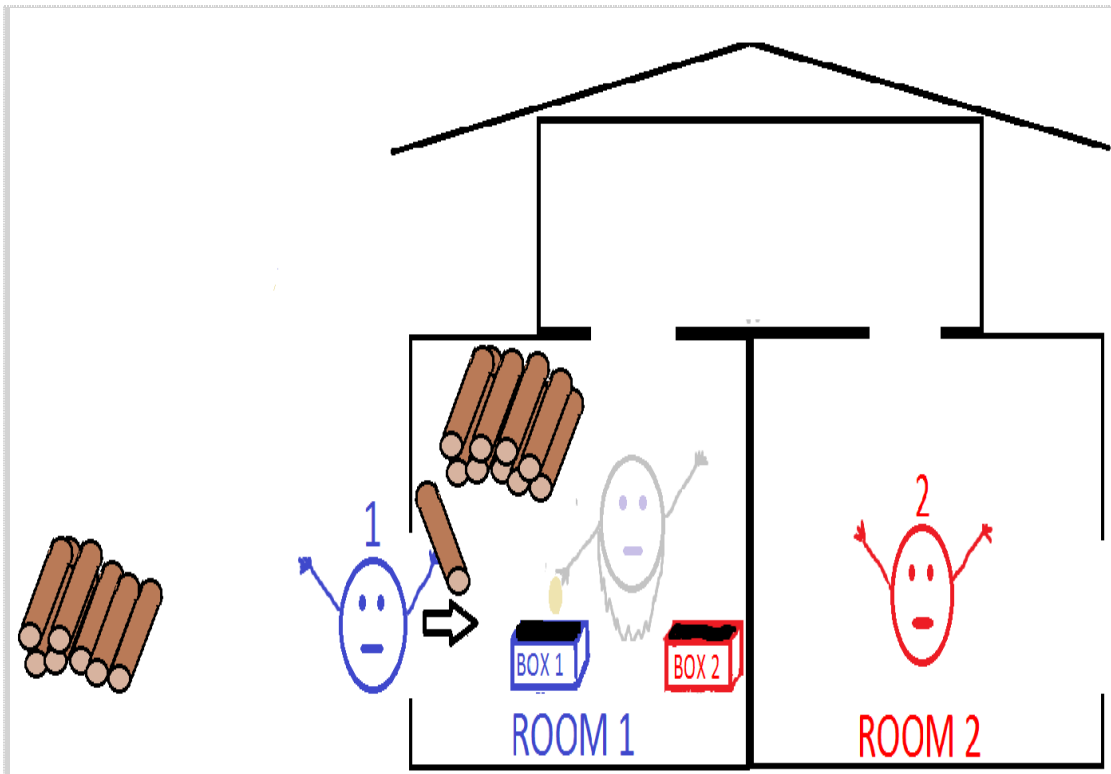




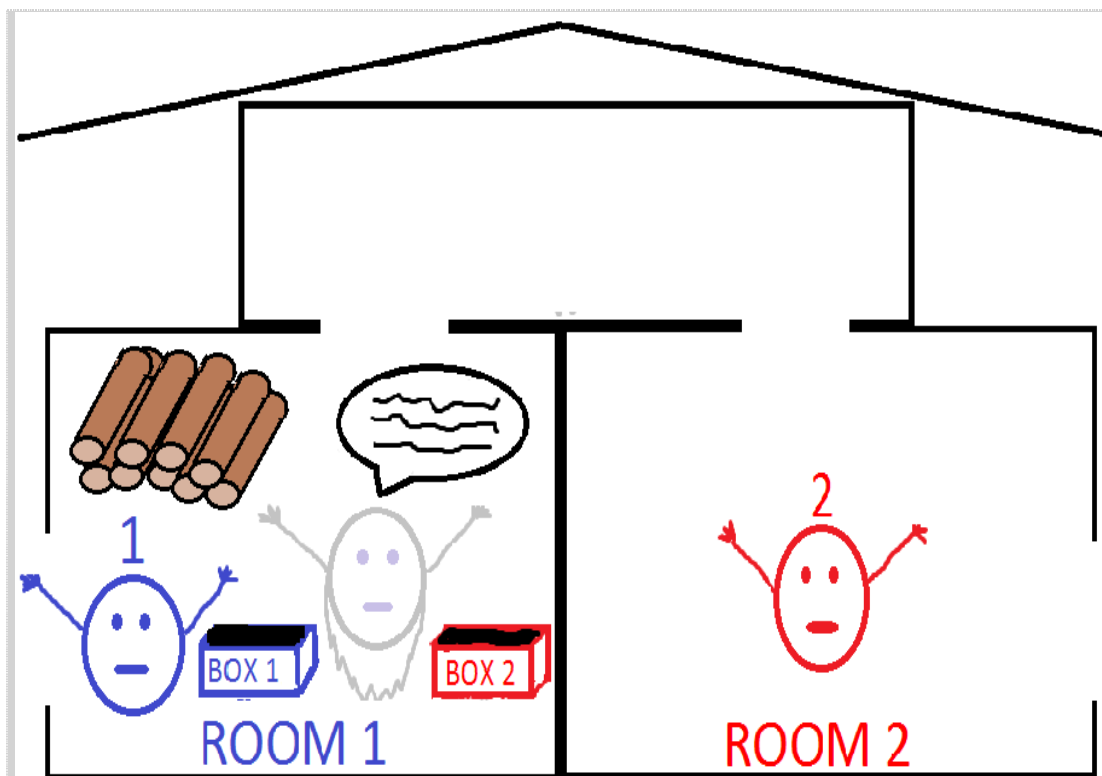
The oldest man in the village would place two boxes before Person 1. The oldest man in the village would say, "I need 10 logs for firewood. There is a log pile outside. I would like you to go get 10 logs from it and bring them inside. For each log you bring in, I will place 1 egg into box 1, up to 10 eggs.



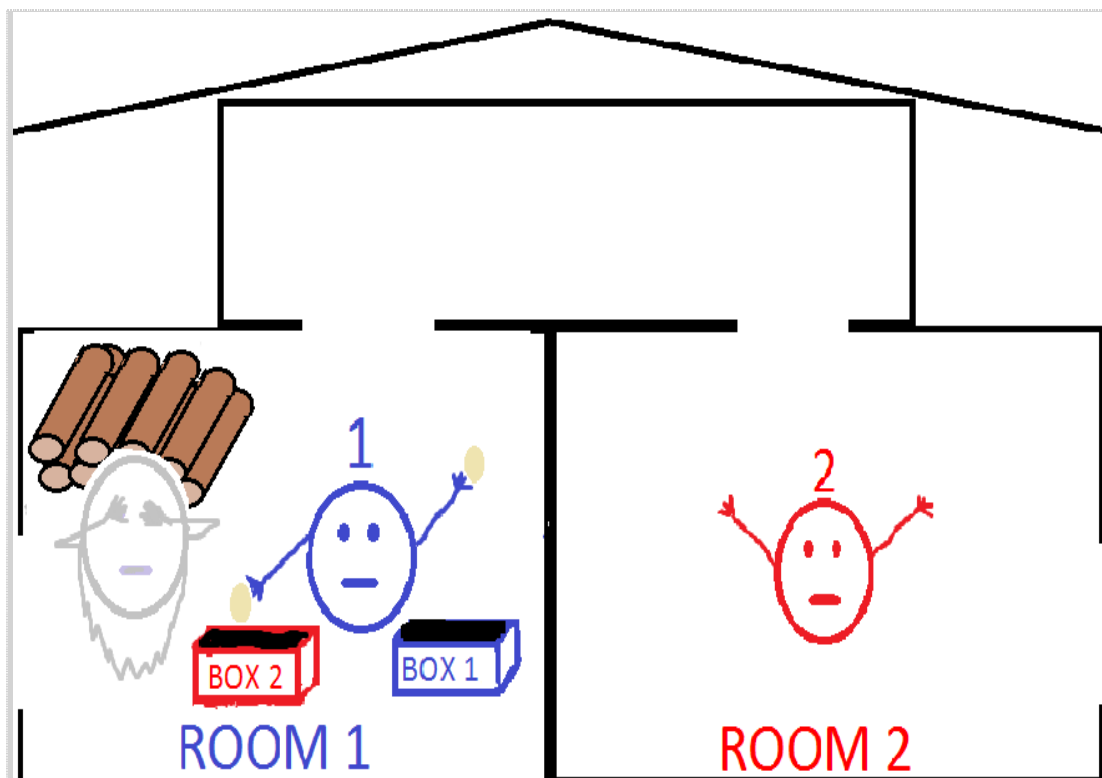




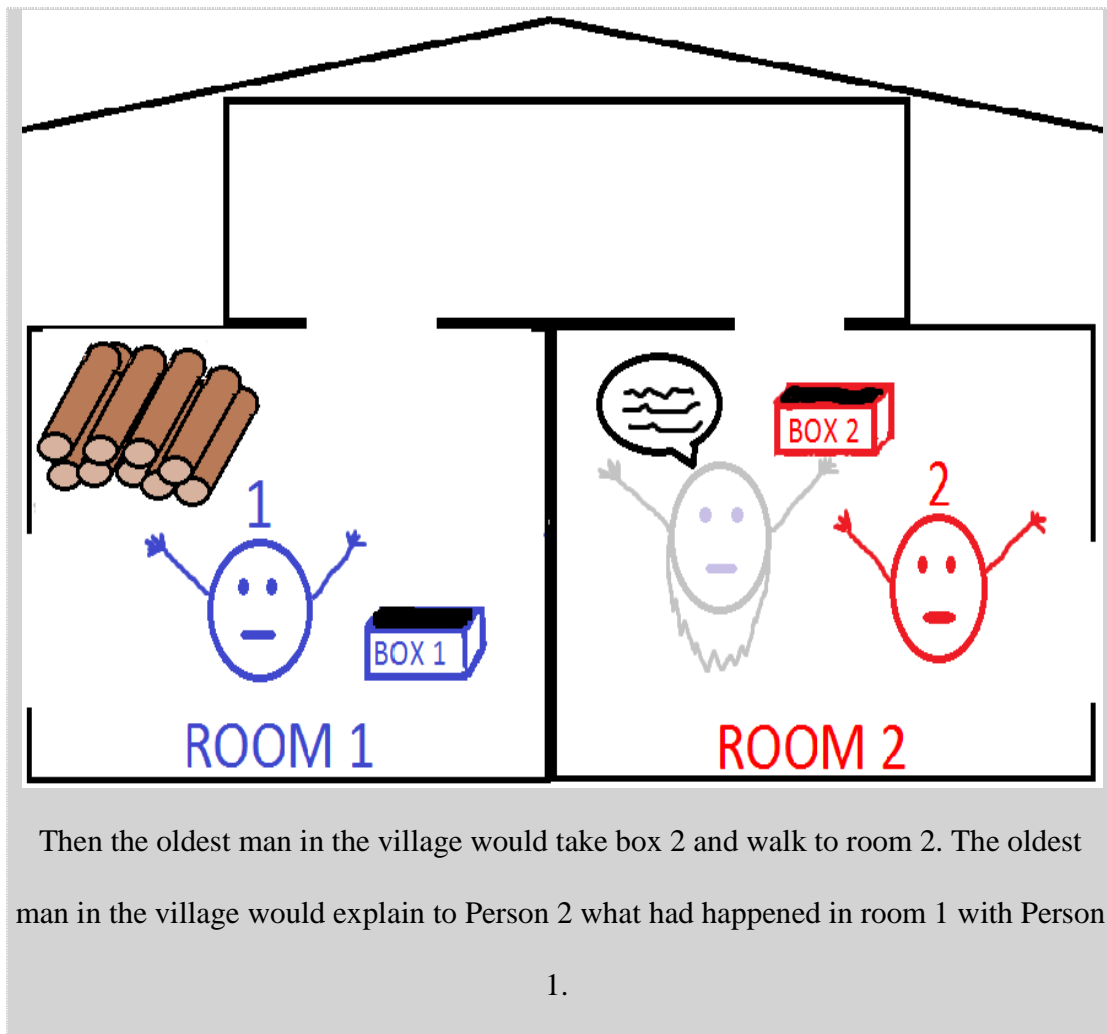
Person 1 would keep bringing in logs until he had brought in 10 logs. The oldest man in the village would keep putting eggs into box 1 until he had put 10 eggs into box 1.

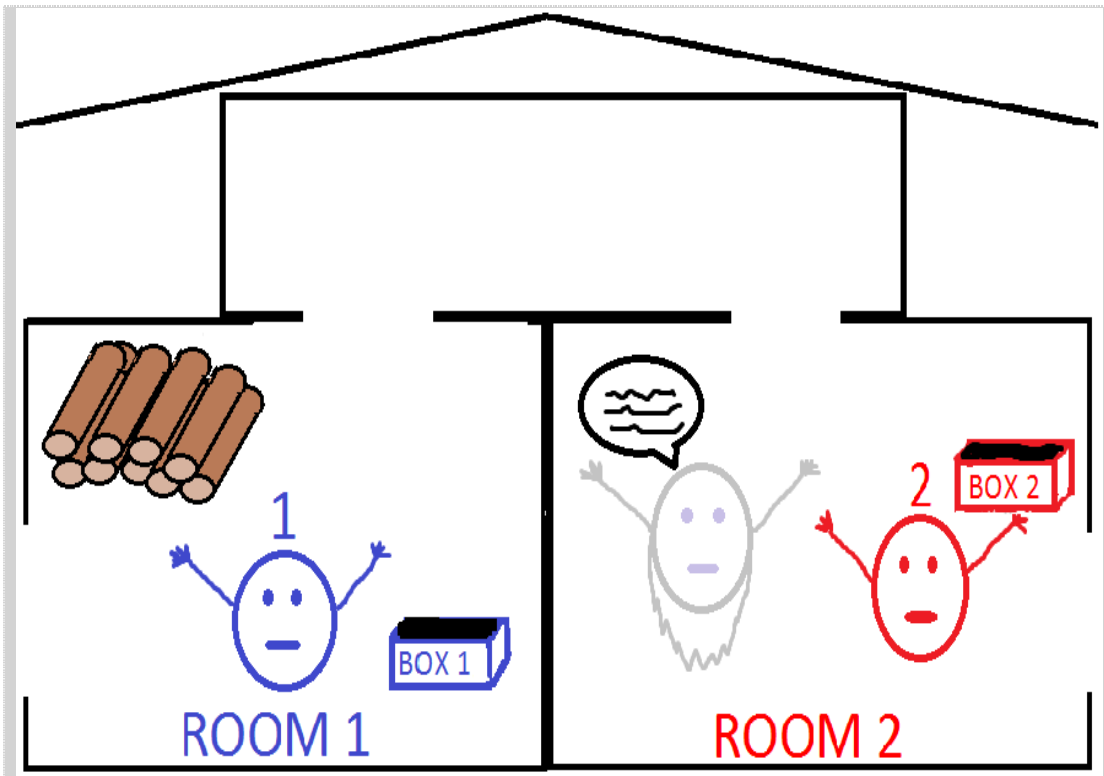


At this point, box 1 would contain 10 eggs and box 2 would still be empty. The oldest man in the village would say, "You may choose to put any number of eggs, from 0 to 10, from box 1 into box 2. I will then take box 2 and give it to another person who I invited to the house today and explain to that person what happened. I will not tell anyone your identity. After you make your decision, I will not look inside either box so I will not know what your decision was. Afterwards, you may have your free meal and then you may leave with box 1, containing whatever number of eggs you chose to keep for yourself. I will now cover my eyes so you can make your decision."



Then the oldest man in the village would cover his eyes so he didn't see what Person 1 was doing. Person 1 would put whatever number of eggs he wished to put into box 2.





The oldest man in the village would then give box 2 to Person 2 without looking inside it. Then he would say, "You may take this box with you when you leave. You may now have your free meal and leave when you are finished."

