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The Neural Basis of Representative Democracy

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Abstract

In politics specifically and society generally people often make decisions on behalf of others or experience the results of decisions made on their behalf. In exactly what manner is this important class of decisions different from traditional situations in which people make decisions on their own behalf? How are people's behavioral and thinking patterns altered by shifting from personal to representational decision-making? Empirical social science research has provided little information on these questions, so in this paper, we draw on evolutionary theory and current knowledge of neuroanatomy to formulate a set of expectations regarding the differences between the decisions and brain processes apparent when people make decisions for themselves and when they make decisions on behalf of others (representation). Using laboratory experiments and, eventually, brain scans, we then provide tests of these hypotheses. One finding of potential interest is that representatives are nearly as mindful of their constituents' resources as they are of their own resources. Though this result would seem to go against standard principal-agent theory, it makes perfect sense when seen in an evolutionary context. Evolution has likely selected for people who care about what others think of them and who take pleasure when they have been the cause of someone else's good fortune. We conclude by describing a set of brain scans (fMRIs) we are in the process of conducting that will make it possible to identify any distinct brain activation patterns occurring when representational as opposed to standard (self) decisions are being made.

A remarkably common class of choice situations in modern societies is decision-making on behalf of others. CEOs make decisions on behalf of their employees; pastors on behalf of their congregants; generals on behalf of their troops; teachers on behalf of their students; gang leaders on behalf of their followers; parents on behalf of their children; members of corporate boards on behalf of shareholders; lawyers on behalf of their clients; and one spouse on behalf of the other. Though these situations differ from each other in important ways, they are united by the fact that one individual makes decisions on behalf of others for whom the decision-maker has special responsibility. Decision-making on behalf of others, also called representation, is especially important in politics because most people possess neither the time nor the inclination required to study and to decide upon every detailed political issue. Even the most ardent advocates of popular involvement in politics, such as Jean-Jacques Rousseau, Jurgen Habermas, and Benjamin Barber, stop well short of advocating pure direct democracy. Representative, rather than direct, democracy has become the mode of political decision-making toward which the world aspires.[1]

But what exactly changes with the shift from personal to representational decision-making? What is different when people make decisions on behalf of others rather than on their own behalf? Despite the ubiquity of representational situations, little if anything is known about 1.) the specific behavioral patterns, and 2.) the areas of brain activity that are evident when decisions are made that affect someone for whom the decision-maker has special responsibility. Thus, in this paper we report the results of

1It is important to note that representation does not occur whenever someone makes a decision that affects someone else but rather occurs when someone has both authority and responsibility for the welfare of a particular person or group. Thus, judges or other neutral third-party decision-makers are not making decisions *on behalf of others* but members of legislative bodies are.

experimental work permitting precise comparisons of people's behavior when making decisions on their own behalf and on behalf of others. Then, we describe a project utilizing fMRI technology that should provide the first indication of the precise regions of the brain that are activated when representational rather than "self" decisions are being made.

Theorizing about Decisions Made on Behalf of Others

Decision making is at the core of human behavior and therefore of the social sciences; if we know the basis on which people make choices we will understand much about the human condition. Accordingly, research on decision making has been intense, with scholars in experimental economics, social psychology, organizational behavior, and neuroscience all providing substantial insights into the nature of decisions individuals make. The decisions these researchers typically study, however, are those people make on their own behalf. Perhaps an experimental subject is asked to divide with another player a small sum of money or perhaps the subject is asked to decide how much money to invest in a public goods communal account. But, as noted, in the real world people frequently make decisions in someone else's stead. What do we know about decisions made on behalf of others?

Classical microeconomic theory provides limited guidance in understanding representational behavior. If people are motivated solely by self-interest, they should not be willing to make any effort to help others—even constituents—unless those constituents are of potential use to the representative. In fact, if institutionally unfettered, "homo economicus" as representative has no reason to care whether good things or bad

things happen to constituents. This is why the central concern of principal-agent theory is the mechanisms by which principals (constituents) can cause agents (representatives) to perform their bidding (Kalt and Zupan, 1984; Goff and Grier, 1993; Rothenberg and Sanders, 2000). On the basis of this theory, predictions for representational behavior are as follows: 1.) if constituents are not in a position to reward or to punish the representative and helping constituents is costless, the theory has no prediction; 2.) if constituents are not in a position to reward or punish the representative and helping constituents entails a cost, the representative will not help the constituent, but 3.) if constituents are in a position to reward or punish the representative, the representative will need to weigh the costs and benefits of helping the constituent. Since life according to this theory is largely reduced to a series of cost/benefit analyses with maximizing personal gain as the sole objective, brain activation patterns should be essentially the same regardless of context.

Evolutionary theory yields quite a different set of expectations. According to this theory, humans are social creatures who depend on groups for assistance in provisioning, offspring-rearing, protection against predators, and a host of other useful and even necessary tasks (see Wilson, 1975). This being the case, natural selection likely works against asocial individuals, and humans of today would tend to possess social skills and sensitivities. Consistent with this theory, empirical work has identified numerous areas in which social skills are in evidence (see, for example, Cosmides and Tooby, 1992, on cheater selection). In short, humans tend to possess the genetic, neurological, and behavioral machinery to nurture groups and to monitor and protect their own status within the group (see Tooby and Cosmides, 1992; Sober and Wilson, 1998; Ostrom, 1998). Part of this machinery is an acute sensitivity to status and reputation. This

sensitivity makes people eager to avoid both being played for a sucker (a sign that status within the group is not what it should be) and being perceived as a leech (a reputation that is certain to harm status within the group).

Applying evolutionary theory to representation produces the expectation that the representative will want good things to happen to constituents regardless of whether constituents are in a position to help the representative. Moreover, the representative, as a result of natural selection, is likely to take pleasure in the gains of constituents and will even make sacrifices in order to bring about gains for constituents. The logic is that when people find themselves in a representational situation, they are likely to want their constituents to experience pleasure. People want to be viewed as useful members of the social unit and what better way to be useful than to be the agent of someone else's gain (or the reason they did not experience loss)? According to evolutionary theory, tangible personal gain will often be subjugated in order to benefit the social unit or the representative's place in it, especially when the decision maker has been given some responsibility for helping specific individuals.

At root is the belief that people take pleasure when others do well and, as has been documented frequently of late in connection with the findings on mirror neurons, are discomforted when others experience pain. A focus on representation, however, leads to the additional expectation that people are especially pleased and satisfied when they have been the agent of someone else's good fortune. This reasoning suggests mirror neurons are only part of the story. It is not just that the pain or pleasure of others we observe is reflected in our own central nervous system but rather that our understanding of the ***cause*** of the pleasure or pain affects the extent to which we are moved by the experiences of others. If this is correct, some part of the brain is magnifying, not just reflecting, the

experiences of others. Specifically, our expectations are that empathic reactions are magnified by agency and that brain activation patterns in response to the experiences of others will be different depending upon whether the person observing these experiences caused them; that is, whether or not the observer had agency for the experiences of the observed.

Why might an individual take extra pleasure (or feel extra pain) in the pleasure (or pain) of other people if that individual has been the cause of the pleasure (or pain)? In many respect, the most sensible way for nature to build a social creature is not simply to select for creatures with empathy but to select for creatures who have even stronger empathic reactions when they have agency over others experiences. A social unit works best not when its members are walking around hoping good things happen to their fellow group members but rather when they are actively taking steps to make good things happen to their compatriots in the group. If people drew as much satisfaction from good things happening to others as they did when they were the cause of those good things happening, people would be less likely to be active in caring for others, though they would be just as passively empathetic. Since actively caring social units are adaptive, evolutionary theory suggests that unique brain patterns will be apparent in representational situations (for both representatives and for constituents) as compared with traditional "personal" decisions.

Previous Research Relevant to Decisions on Behalf of Others

To the extent microeconomic and evolutionary theory lead to different expectations, empirical work comes down firmly on the side of evolutionary theory. Certainly there is overwhelming evidence that individuals playing economic games are

incredibly sensitive to others involved. If the "others" are computers, people play (and brains operate) differently than if the others are human beings (McCabe et al., 2001). If the others are anonymous abstractions, people play differently than if they are personified, even if this personification consists of nothing more than cartoonish eye-spots placed at the top of a computer screen (Haley and Fessler, 2005; more generally, see Sullivan and Masters, 1988; Masters and Sullivan, 1989; Dawes, van de Kragt, and Orbell, 1990; Blount, 1995). If subjects know that others will learn of their decisions, people play differently (Hoffman, McCabe, Shachat, and Smith, 2000; van Dijk and Vermunt, 2000; Larimer, 2003). If the others are believed to have intentionally rather than accidentally made a decision, people behave differently (Hibbing and Alford, 2004). And if the others are believed to be ambitious, people behave differently toward them even when the objective decisions are the same (Smith, Larimer, Littvay, and Hibbing, 2007).

Students of the decision sciences have already conducted useful analyses comparing self decisions with the advice people tend to give others (Kray, 2000; Jonas and Frey, 2003), comparing self decisions to decisions made in groups (Robert and Carvenale, 1997; Messick, Moore, and Bazerman, 1997; Morgan and Tindale, 2003), and comparing self decisions to neutral third-party decisions (Sniezek and Van Swol, 2001; Fehr and Gachter, 2002). But representational decision-making is not the same as either advisor-based decision-making, group-based decision-making, or judge-based decision-making. Representatives are not merely members of a group faced with a collective decision; unlike judges, representatives have an attachment to a particular principal or group of principals; and unlike advisors, representatives actually make the final decision. So the empirical differences attending typical "self" decisions and representational decisions are still undetermined.

For their part, political theorists have devoted great attention to issues surrounding the representational relationship. Much of the early attention was directed at the normative matter of the manner in which representatives should approach their assignment. For example, theorists such as John Stuart Mill (1975 [1861]) and Jean-Jacques Rousseau (1946 [1762]) thought that, if people could not act on their on behalf, then representatives should at least try to do exactly what the represented would have done (the so-called Ainstructed delegate@ model). Edmund Burke (1949 [1775-7]), on the other hand, thought representatives should behave as Atrustees,@ a role in which they act in the interest of the represented even as these constituents may have expressed a different preference. Pitkin (1972) provides a masterful listing and analysis of the many variations on the concept of representation.

And modern empirical political scientists have conducted extensive research on the extent to which the decisions of representatives are congruent with the preferences of their constituents or principals. The classic work in this vein was undertaken by Warren Miller and Donald Stokes (1963) and they found that policy congruence was present for some salient issues such as race and, to a lesser extent, social welfare, but not for less salient issues such as foreign policy. Additional informative empirical studies of political representation have been conducted by Matthews, 1960; Froman, 1963; Sullivan and O=Connor, 1972; Clausen, 1973; Kingdon, 1973; Fiorina, 1974; Kuklinski and Elling, 1977; Erikson, 1978; Monroe, 1979; McCrone and Kuklinski, 1979; Erikson and Wright, 1980; Bianco, 1984; Page, Shapiro, Gronke, and Rosenberg, 1984; Wright, 1989; Bartels, 1991; Poole and Romer, 1993; Oppenheimer, 1996; Alvarez and Gronke, 1996; Bailey and Brady, 1998; Lee and Oppenheimer, 1999; Hill and Hurley, 1999; Bishin, 2000; Erikson and Wright, 2001; and Hurley and Hill, 2003, just to name a few. Thanks to this

research, scholars now possess a deep understanding of the conditions under which policy congruence is more or less likely to be present in representational democracy.

What we do not know is the differences between decisions for self and decisions on behalf of others. People seem sensitive to others but this fact alone does not allow us to compare sensitivity to the needs of oneself with sensitivity to the needs of constituents. To make this determination we need behavioral results from parallel decision environments, one documenting traditional personal decisions and the other documenting agents' decisions on behalf of principals, and this is where existing research comes up short. In response to this need, we designed and conducted novel experiments allowing self and representational decisions to be compared. Moreover, previous research has not established if different brain activation patterns are in evidence depending upon whether people are deciding on their own behalf or on behalf of others. To rectify this situation, it is necessary to obtain brain scans of people deciding for themselves and deciding on behalf of others. The question we propose is not do (or should) those acting on behalf of others (such as members of Congress) actually follow the dictates of those to whom they are responsible, but rather do people acting on behalf of others behave and think differently than they would if their actions only affected themselves and, if so, how. In order to make this determination, we conducted two distinct batteries of experiments and are conducting brain scans of approximately 40 subjects. We describe each of these efforts in the sections that follow.

Round 1: Experiments with the Dictator Game

In order to measure the behavioral differences generated by taking decision-making authority out of the hands of the person experiencing the consequences of the

decision and giving it to an agent (or representative), we need to construct decision situations that are as similar as possible except for the fact that in one the decision-maker is deciding on his/her own behalf and in the other the decision is being made on behalf of others. Such requirements demand an experimental setting and that is what we employ here. In the late spring and summer of 2005, 88 experimental subjects were recruited and brought to the Behavioral Research Lab on the Rice University campus, an NSF-funded facility with approximately 30 computer terminals, a waiting room, a debriefing room, and adequate parking. Most of the subjects were Rice students, meaning their average age is somewhat lower than would be the case in a national sample just as the average family income is substantially higher (see appendix for demographic details). But since subjects were randomly assigned to one of the three cells and since our interest is in behavioral differences across the three cells, the typicality of subjects is not of pressing concern. Once at the lab, subjects were assigned either to make decisions on their own behalf, to make decisions on behalf of an unidentified other individual or to make decisions on behalf of an individual they had just met after signing the experimental consent form but before beginning the experiment.

Each subject then played a version of the dictator game. In this game, subjects are given a sum of money, in this case $10, and told to divide it in any fashion desired with another player (for the sake of simplicity only whole dollar divisions were permitted). The dividing player is fully aware that the receiving player has no recourse and this is what makes the experimental subjects dictators of a sort. The central variable in our study, then, is the extent to which subjects in cell 1 keep a significant portion of the $10 for themselves and the extent to which subjects in cells 2 and 3 keep a significant portion of the $10 for their constituent. Subjects in cells 2 and 3 were told that they would

receive a set fee for serving as the representative of another person. Thus, instead of needing to decide for themselves how much of the $10 they would keep, they needed to decide on behalf of another person how much of the $10 that "constituent" would keep and how much would be passed along to the unspecified other player.

Respondents in both cells 2 and 3 were acting as representatives. The difference is that those in cell 2 were representing an individual they had never met and who was referred to in the experiment only by initials while those in cell 3 were representing an individual they had met just a few moments before the beginning of the experiment and who they believed to be occupying an adjacent computer terminal during the experiment.

Since all parties are aware that these are single-play games, according to microeconomic theory, those making decisions for themselves have no incentive not to keep the entire $10. But evolutionary theory places the game situation in a social context and expects that decision-makers in the dictator game will not take full advantage of their powerful position. Turning to the representational situations, since keeping money for the constituent is costless for the representative, classical economic theory has no prediction (the representative simply has no dog in the fight) but evolutionary theory expects continued sensitivity to the needs of the constituent (tempered perhaps by the fact that the representative also feels some concern for the other human being who does not happen to be a constituent but will still be affected by the representative's decision. Comparing the two representational situations, classical economic theory does not predict that representatives who have met their constituent should be any more generous than representatives who have not met their constituent, while evolutionary theory has a clear prediction that representatives will be more generous to those with whom they have had some social interaction even if the interaction was a cursory meeting.

In most divide-the-dollar games of this sort, subjects display a strong attraction to equal divisions and our results are no different in this regard. 47 of the 88 respondents opted for a $5-$5 division. In light of this fact, perhaps the most appropriate way of presenting the results is to compare the percent of subjects in each of the three different cells keeping more than half (as opposed to half) of the $10. When this is done we obtain the results presented in Table 1. Those subjects assigned to play the standard dictator game—that is, those assigned to make decisions for themselves—were reasonably generous with nearly 54 percent dividing the money equally and just 46.2 percent keeping more than half for themselves. Consistent with countless other experiments employing economic games (see Ostrom, 1998; Camerer and Loewenstein, 2004, for a good summaries), people tend to be less maximizing, even in anonymous one-shot games, than standard microeconomic theory predicts.

Our central interest, however, is in comparing the decisions people make on their own behalf with those they make on behalf of others and here we see some fascinating contrasts. When the constituent is not made tangible or given any social reality, subjects serving as representatives are less likely to keep more than half of the money for their constituent than was the case for subjects deciding on their own behalf. Only 26.7 percent of respondents kept more than half for an anonymous constituent. But any inclination for representatives to be less generous to constituents than people are to themselves disappears if the representative and constituent have met. When the representative has a face to attach to the constituent, representatives, as we expected, become much more likely to be at least as solicitous of the interest of their constituent as they were of their own interest. Over 62 percent of the subjects in this category awarded more than half of the $10 to their constituents. This difference in behavior depending

upon whether the decision was for "self" or for a known constituent does not reach statistical significance, and even though subjects deciding on behalf of a known constituent are more likely to keep over half than are subjects deciding for themselves. If we calculate the mean amount kept, the difference between the 'self' condition and the 'known constituent condition is eliminated with the subjects in both conditions keeping an average of about $7 while the mean amount of money kept for an anonymous other is only $5.70. A willingness to attend to the interests of a constituent appears to be very easy to trigger. Here, only a brief introduction, without even first names exchanged, was sufficient to raise behavior on behalf another person to the same level as behavior for oneself. This is true even though there are no institutional arrangements, such as a constituent controlled re-election decision or constituent control of the representative's payment, typically considered essential to bind representatives' behavior to constituents' interests.

Table 1
Dictator Game Decisions for Self and Constituents

Treatment Condition	% keeping >1/2	Mean $'s Kept	Dif. From Self	Prob. (2-tail)	n
Self	46.2%	7.08	na	na	26
Anonymous Representative	26.7%	5.70	1.38	.017	30
Introduced Representative	62.5%	6.91	0.17	.773	32

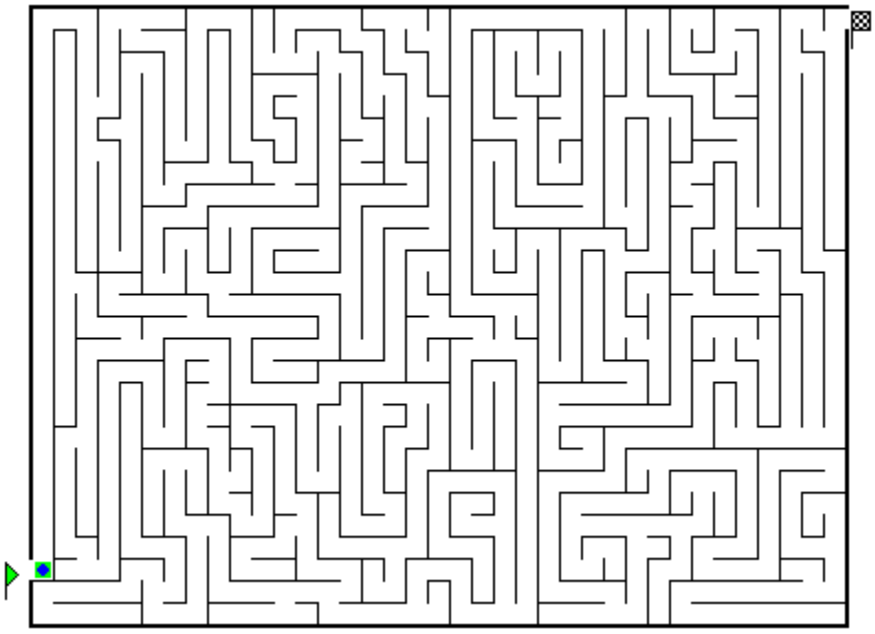
Round 2: Experiments on Making an Effort and Taking a Risk

The dictator game captures only one type of decision that representatives may need to make for constituents—and a somewhat atypical one at that. In the experimental design presented above, the representative in essence had to arbitrate between giving

money to the constituent and giving money to another human being, known to the representative, in the "anonymous" version of the experiment at least, as well as they know the constituent—which is to say not at all. Moreover, there is no cost to the representative in giving money to the constituent. We wanted a better test of the activities a representative is willing to undertake on behalf of a constituent, without the complications of a third party entering in and when helping a constituent is not costless to a representative.

Thus, we recruited a second group of experimental subjects and, as with the earlier group, asked some to make decisions on their own behalf and asked others to make decisions on behalf of constituents (see appendix for demographic details). This time, however, the central issue was how much effort subjects were willing to engage in order to earn money. Subjects were presented with a challenging maze (see Figure 1 below) on their computer screen and told to spend some time trying to solve it. With this example in mind, they were told that additional money would be provided for each maze they completed later in the session. Subjects in the "representative" cell were told that each maze they completed would earn money for their constituent while subjects in the "self" cell were told that each maze they completed would earn money for them. As with the first round of experiments, some representatives had been physically introduced to their constituent while others had been assigned to an anonymous constituent. Thus comparisons are possible between the amount of effort people were willing to make for themselves, for unknown constituents, and for known constituents.

Figure 1
Sample Maze



Microeconomic theory predicts representatives should make no effort on behalf of constituents since all involved with the experiments were aware that the game was single play and that the constituent would not be in a position to turn the tables on the representative, or to reward any reputational advantage in future interactions. It also predicts that the extent to which the constituent is known to the representative should be irrelevant. Evolutionary theory, on the other hand, predicts that representatives will be surprisingly attentive to the needs of constituents, willing to make sometimes substantial efforts on their behalf and that this effort will increase the more they are acquainted with the constituent.

Table 2
Mean Effort for Self and Constituents

Treatment Condition	% > 5 mazes	Mean Effort	Dif. From Self	Prob. 2-tailed	n
Self	41.6%	5.54	na	na	89
Anonymous Representative	13.6	3.86	1.68	.032	22
Introduced Representative	40.0	5.50	0.03	.963	20

Adding real cost to the decision has surprisingly little impact on the resulting behaviors. The concern for an anonymous constituent falls a bit further below that found when deciding for oneself than was the case in the costless dictator game, but the difference is slight. The more interesting finding is that even for an anonymous single interaction constituent the average effort is well above zero at almost 4 mazes, and a few subjects actually agreed to complete the maximum of ten mazes. More striking is the fact that with only a brief introduction, the willingness to perform an effortful task to benefit a constituent is as high as the willingness to perform the same task to benefit oneself. Again, this is true even though there are no institutional arrangements to bind representatives' behavior to constituents' interests. In fact, adding the possibility of re-election to the instructions given to the representative that had already been given the brief introduction to their constituents did not provide any increase in effort on the behalf of the constituent.

The fact that in this version of the experiment we have subjects actually assigned to both the role of representative and the role of constituent means that we can also explore the impact of contact on the expectations of constituents. We asked each constituent to

indicate what number of mazes they would ask their representative to complete if they were given the opportunity to communicate that request to their representative. The results in Table 3 induicate that here too, contact makes a difference. Anonymous constituents would ask their representatives to do as much for them as subjects acting for themselves do (means are 5.57 and 5.54 respectively). Introduced constituents in contrast moderate their request and ask for less than the subjects acting for themselves (means are 4.81 and 5.54 respectively). The result is that anonymous representatives are on average agreeing to do substantially fewer mazes than their constituents' would prefer (3.86 compared to the mean constituent preference of 5.57, prob. .072). The reverse is true for introduced pairs, where the mean number of mazes completed at 5.50 is actually *above* the mean number that constituents would have requested at 4.81 mazes (prob. .531). Both parties have shifted in response to the brief introduction and the adjustment provides a far more salutary representational outcome.

Table 3
Mean Effort for Self and Constituents

Treatment Condition	% > 5 mazes	Mean Effort	n
Self	41.6%	5.54	89
Anonymous Constituent	42.9	5.57	21
Anonymous Representative	13.6	3.86	22
Introduced Constituent	33.3	4.81	21
Introduced Representative	40.0	5.50	20

In addition to shifting the mean level of effort, introducing constituents and representatives also shifts the distribution of effort choices. Effort choices made for oneself (see Figure 2) tend to peak at two modes, five mazes (24%) and ten mazes (26%). The effort choices of anonymous representatives on behalf of their constituents (see Figure 3) are shifted down, with modes at two mazes (32%) and five mazes (23%). In contrast, introduced representatives (see Figure 4) have a distribution that is pulled apart, with modes at two mazes (20%) and ten mazes (35%). The increase in willingness to complete mazes for introduced constituents is clear, but it is not universal. A subset of subjects appears to be immune from the effects of this change in the context of their interaction with their constituent. This notion of distinct types is one that motivates the next stage of our research project.

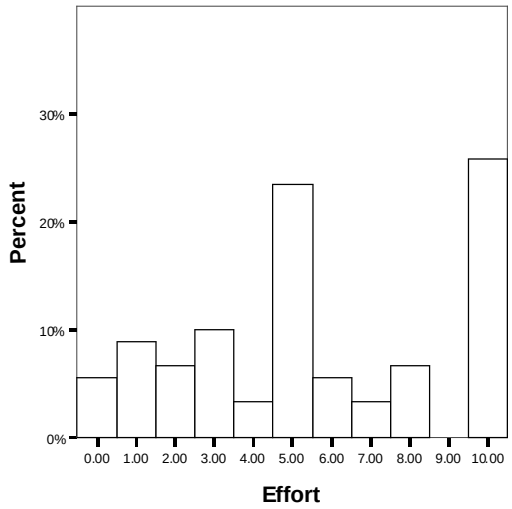


Figure 2: Self

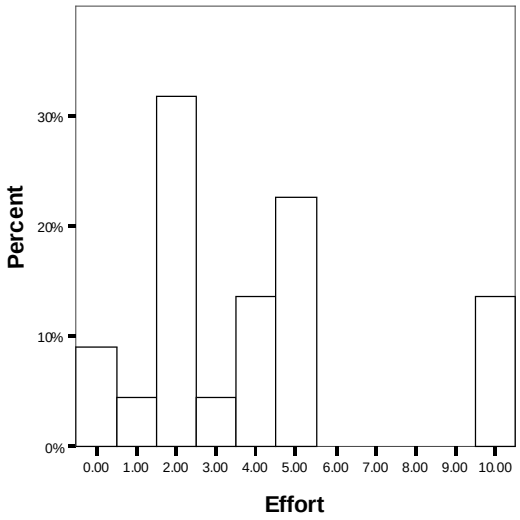


Figure 3: Anonymous Representative

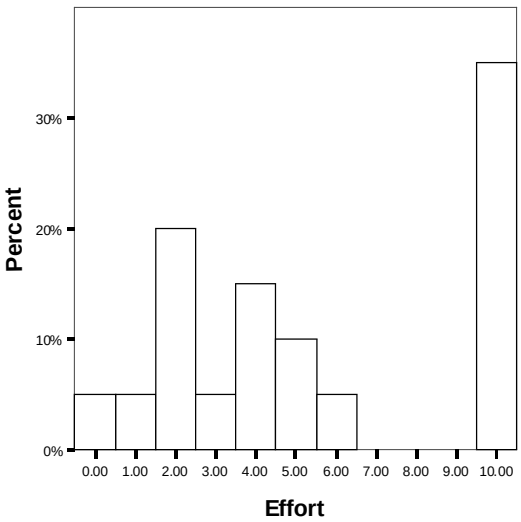


Figure 4: Introduced Representative

Round 3: fMRIs on Agency-Amplified Empathy

Representation can serve as a window to larger issues concerning the very nature of human sociality, but to take advantage of this fact it is necessary to observe activation patterns of the brain under different situations. Many scholars entrenched in the behavioralist tradition fail to see why it is useful to determine the specific parts of the brain involved with particular activities. They believe the key goal of social scientists should be understanding behavior itself and that patterns of brain activity are merely part of a black box that is unnecessary to open. Along with those in the burgeoning field of neuroeconomics, however, we maintain that understanding the parts of the brain involved with political, economic, and social thinking is extremely helpful in identifying the nature and causes of behavior. Our interest in representation provides a good illustration of this potential value.

Thanks to cooperation from scholars at the Human Neuroimaging Lab at the Baylor Medical Center in Houston, we are in the process of conducting fMRIs on 40 subjects from the Houston area. HNL has pioneered the practice of hyperscanning in which an individual in one scanner can see the decisions made by the subject in the adjacent scanner and we will be taking advantage of this capability. After performing the necessary baseline brain scans, subjects will be presented with two sets of tasks. One is the already-described "effort" task (see round 2 above) in which subjects must decide how many mazes they are willing to complete to earn money for themselves and how many mazes they are willing to complete to earn money for their "constituent" in the other scanner. The results of these procedures will not be known for some time.

But the second set of tasks entails still another experimental scenario and will be completed soon. In this experiment, subjects must pick one of two colored boxes appearing on their computer screen. Picking the correct color results in an increase in the money subjects were granted at the beginning of the session; picking the incorrect color, results in a decrease in that money. The "correct" color is determined by the computer at random. In one battery of tests, subjects will be making choices on their own behalf; in the other, they will be choosing on behalf of the person in the other scanner. After each choice has been made, the computer will reveal whether the color selected was right or wrong and this basic process will be repeated multiple times for "self" decisions as well as for decisions made on behalf of the person in the other scanner. Whenever subjects are not deciding, they will be observing the computer screen of the subject who is making the decision. Subjects will be scanned both as the choice (color selection) is being made and also as the outcome is revealed (was the color selected the correct one or not?). Both of these distinct slices will provide valuable information and we discuss each in turn.

Scanning Choice

Scanning while the choice is being made will make it possible to identify areas of the brain that are differentially active when choices on behalf of others (as opposed to choices on behalf of oneself) are being made. Previous research has focused on the different activation patterns evident in the cingulate cortex when the decision-maker is oneself (me) or someone else (not me). The cingulate cortex is a large and important part of the limbic cortex and, along with the amygdala and hippocampus, a central component of what is know as the limbic system, heavily involved with emotionality, sexual behaviors, and memory (see Tomlin et al., 2006). The cingulate cortex, especially the

anterior region, is known to monitor situations and to recruit regions of the prefrontal cortex if an executive decision is likely to be necessary. For example, if one course of action may lead to personal monetary gain but create the possibility of social disapproval, the anterior cingulate cortex (ACC) will register activity and so will the prefrontal cortex because tradeoffs are involved and a non-obvious decision is required. But if a particular course of action yields both monetary gains and social approval or if nothing seems wrong with the previous or default course of action, ACC and PFC activity is unlikely to be necessary and the "unthinking" course of action will be pursued (see Miller and Cohen, 2001). Increasingly, the cingulate cortex is seen as central to social interactions with other human beings, perhaps because in virtually all social interactions, there are subtle pros, cons, and interpretations associated with virtually any statement, decision, or action. Thus, many of the economic games that are currently and properly so popular in behavioral economics, games in which people interact over tangible (usually monetary) outcomes turn out to stimulate the cingulate cortex, among other brain regions (Bhatt and Camerer, 2005).[2]

The intriguing findings of Tomlin et al. (2006) suggest that the cingulate cortex, like many other regions of the brain, serves as a sort of map, with revelations of the decision of others registering in the anterior cingulate and decisions made by oneself registering in the middle rather than the anterior region of the cingulate. Decisions made by "me" and decisions made by others or, as the authors put it, "not me" appear to activate distinct parts of the cingulate cortex. As fascinating as these results are, Tomlin

2 A related and longer-standing finding is that when subjects are asked to perform a challenging cognitive task these medial prefrontal and cingulate cortex areas deactivate, suggesting that the brain's default mode of operation is self-reflective thought (see Gusnard et al., 2001) but that this default pattern is overridden when the brain really needs to focus on a task that does not require self-referential considerations. Further, it appears as though considerations involving hopes and goals occur more heavily in the anterior cingulate cortex while considerations involving one's obligations and duties are concentrated in the posterior cingulate cortex (Johnson et al., 2006).

et al.'s reliance on the trust game renders it possible only to separate agency and not the gainer/loser (hereafter beneficiary) of the decision. Our design produces brain scans of people who are in each of these four categories:

1. both agent and beneficiary (self)
2. agent but not beneficiary (representative)
3. beneficiary but not agent (constituent)
4. neither agent nor beneficiary (observer)

Representation separates agency from the person experiencing the gains/losses: representatives decide and constituents experience. Institutional features such as the potential for reelection are attempts to turn agents into potential winners/losers, but in its pure sense representation separates decisions from tangible consequences. The four situations listed above will allow us to compare and contrast brain activation patterns. The most telling comparisons will be between self and representative and then again between constituent and observer. In the first comparison, the person is making a decision in each situation and we will be able to see the differences in the brain when decisions are for self and when they are for a constituent.

What makes representation interesting is that it is not entirely "me" and not entirely "not me." For the representative, the decision is made by "me" but the impact is on "not me." For the constituent, the decision is by "not me" but the impact is on "me." This situation affords several possibilities, one of which is to expand upon the research on the cingulate cortex. Does the identity of the person experiencing the gains or losses affect cingulate cortex activity or is that activity determined entirely by whether or not the subject is the agent of the decision. Are those making representational decisions thinking

about themselves (middle of cingulate cortex) or about their constituents (anterior cingulate cortex)?

We hypothesize there will be substantial activation in the middle cingulate cortex of the representative even though in our design the representative has nothing to gain or lose by virtue of the decision made. If this is the case, it would suggest that representatives are pondering how their decision is likely to reflect upon them even though they have absolutely no monetary stake in the outcome. As such, this finding would be consistent with evolutionary theory (people are sensitive to the social ramifications of their decisions) and inconsistent with microeconomic theory (people are primarily concerned with their own tangible gains). If, on the other hand, the location of cingulate cortex activity is found to be governed primarily by the identity of the person who gains or loses (the beneficiary) and not by the identity of the person with agency, it would provide support for microeconomic theory's emphasis on outcome and not potential social consequencess.

Scanning Outcome

Perhaps even more important than the scans conducted during the selection of the color are the scans conducted as subjects find out whether the color selected is correct or incorrect; that is, whether the selection led to a gain of money or a loss. Recent studies have indicated that the caudate nucleus (part of the basal ganglia which is just below the white matter of the cortex) and other reward-sensitive parts of the brain can be triggered by pleasing events or by the anticipation of pleasing events. De Quervain et al. (2004), for example, found increased activity in the caudate nucleus when the victims of unfair offers were given the opportunity to inflict punishment on those who had behaved

unfairly. Apparently we derive satisfaction by punishing those who have behaved selfishly. Moreover, the greater an individual's caudate activity as the decision is being made, the more likely that individual is to punish the malefactor (deQuervain et al., 2004). In other words, caudate activity indicates those individuals who tend to derive a good deal of pleasure from inflicting punishment on malefactors and who, therefore, tend to punish them. Taken in combination with the findings of Sanfey et al. (2003) on the pain and disgust (centered in the anterior insula) that are provoked by unfair treatment, this finding suggests that people punish others, even if it is costly to them, both because they have been hurt and because they derive pleasure from punishing.

These previous findings are extremely useful but somewhat narrow. Doing bad things (punishing) to bad people is only one of the situations people are likely to face in the course of group living. Especially if the focus is on representation, a more revealing situation may occur when people do something good on behalf of someone else. Does the brain of a representative react differently to outcomes they have caused than does the brain of a person merely observing the revelation of an outcome to another person? By comparing the brain activation patterns of subjects who merely observe other people either earn or lose money (because they picked the correct or the incorrect color) with those of subjects who observe a constituent either earn or lose money ***because the subject made the correct (or the incorrect) decision***, we will be able to determine the changes attributable to agency.

As mentioned previously, our hypothesis is that agency magnifies empathy and this requires activation of certain parts of the brain not activated when agency is absent. The primary region of interest is the caudate nucleus but we will also analyze other elements of the reward processing circuitry of the brain. It may be that an individual's

empathy-related behavior is not merely the product of the much-discussed mirror neurons but rather the individual's mirror neurons as magnified by activity in the caudate nucleus and elsewhere. Individuals who are not just empathetic but whose empathy is exacerbated when they are in some sense culpable for the other person's condition are more likely to try to help others than are those whose empathy is unrelated to their agency. If this is true, by identifying those subjects for whom their own agency magnifies empathy, we should be able to make predictions about behavior. For example, individuals with agency-magnified empathy should be more likely to go to greater effort (solve more mazes) in order to earn money for a constituent. Moreover, those who want to be representatives may have a greater degree of agency-amplified empathy than is typical.

Whereas when the focus is on choice, the crucial comparison is between those choosing for themselves and those choosing for others (that is, between "self" and representative), when the focus is on reaction to outcome, the crucial comparison is between those observing another person discover an outcome and those observing another person discover an outcome that the subject has caused (that is, between "observer" and representative). Either way, information on patterns of brain activity will be informative regarding not only the motivations behind typical human behaviors but also in predicting the individuals likely to behave in certain ways. These connections between brain patterns and social behavior could have their roots in genetic differences (see Alford, Funk, and Hibbing, 2005) or they could be the products of long-standing but environmentally-shaped forces. Regardless, their existence would suggest a reason for the substantial over-time consistency in individual-level human behavior. Empathetic

people today tend to be empathetic tomorrow—and the source of this consistency is apparent once brain scans are conducted.

Conclusion

Previous studies of political representation have pondered whether representatives should and do take steps to provide constituents with policies desired by constituents. The result has been both sophisticated cogitation, such as that by Edmund Burke, on the degree to which representatives should use their own judgment, and impressive empirical evidence, such as that provided by Miller and Stokes (1963) on the precise conditions under which constituent views and representative actions coincide. Our approach to representation has gone in a different direction. We want to understand the precise differences between decisions people make for themselves and decisions they make on behalf of others. In order to make these two situations as parallel as possible, we employed laboratory experiments, but since we are interested both in behavioral patterns and brain activation patterns, we are also in the process of conducting experiments in the scan (fMRI) environment.

While results from these scans are not yet available, they will be soon, and in the meantime we can say that the behavioral results of the first two rounds of experiments indicate that people are remarkably attentive to the needs of constituents. They give constituents approximately as much money as they take when they are deciding for themselves (especially when they have personally met their constituent) and they are willing to work almost as hard for the sake of constituents as they are for themselves. On the whole, representatives are deeply concerned with the welfare of their constituents even when representatives reap no financial or other advantages from their constituents

being happy—and sometimes even have to pay a cost (in terms of effort made) to make them so. We contend that institutional mechanisms designed to make agents act to benefit constituents are often unnecessary. They almost certainly increase attentiveness to constituents but even without them representatives would still be deeply concerned for the welfare of their constituents. We contend these findings are consistent with evolutionary theory stressing people's long-standing and probably genetic urges to please others in the social unit.

Brain scans will help to reveal the neural basis of representatives' sensitivity to the welfare of constituents. We predict that evolution has given humans not just empathy, but agency-magnified empathy such that representatives feel more intensely the gains and losses of a person when they have been responsible for that person's status than when they have merely observed that person make decisions that lead to gains and losses. If the scan results are as we predict, we will be left with a deeper understanding of the nature of representation and of the reasons representatives frequently pander to constituents but also of the aspects of the human physiological condition that make us more eager to do good for those in our charge than merely to watch good happen to others. The key to building a strong social unit goes beyond empathic feelings to actions taken to help others, especially others who, for whatever reason, have been placed in our charge.

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Appendix: Demographics for Round 1 Subjects (n=88)

	LE 25	25-35							
Age	79.5%	20.5%							
	Very Conservative	Conservative	Moderate Leaning Cons.	Moderate	Moderate Leaning Lib.	Liberal	Very Liberal	Don't Know	
Ideology	2.3%	6.8%	12.5%	9.1%	25.0%	23.9%	13.6%	6.8%	
	High School	Some College	College Grad.	Post Grad.					
Education	14.8%	46.6%	22.7%	15.9%					
	White/Anglo	Black / African Amer.	Hispanic / Mexican Amer.	Asian Amer.	Something Else	Don't Know			
Race/Ethnicity	43.2%	14.8%	10.2%	18.2%	12.5%	1.1%			
	Strong Republican	Weak Republican	Independent leaning Rep.	Independent	Independent leaning Dem.	Weak Democrat	Strong Democrat	Other Party	Don't Know
Party Id	1.1%	9.1%	6.8%	11.4%	17.0%	22.7%	17.0%	4.5%	10.2%
	LT $15K	$15K-$25K	$25K-$35K	$35K-$50K	$50K-$65K	$65K-$80K	$80K-$100K	Over $100K	Refused
Family Income	9.1%	13.6%	5.7%	11.4%	8.0%	10.2%	8.0%	28.4%	5.7%

Appendix: Demographics for Round 2 Subjects (n=211)

	LE 25	25-35	36-49	50-64	GE 65				
Age	71.6%	9.5%	11.4%	5.7%	1.9%				
	Very Conservative	Conservative	Moderate Leaning Cons.	Moderate	Moderate Leaning Lib.	Liberal	Very Liberal	Don't Know	
Ideology	3.8%	14.2%	13.3%	15.2%	18.5%	22.7%	9.5%	2.8%	
	High School	Some College	College Grad.	Post Grad.					
Education	25.5%	57.8%	11.4%	5.2%					
	White/Anglo	Black / African Amer.	Hispanic / Mexican Amer.	Asian Amer.	Something Else				
Race/Ethnicity	49.8%	18.5%	9.5%	15.6%	6.6%				
	Strong Republican	Weak Republican	Independent leaning Rep.	Independent	Independent leaning Dem.	Weak Democrat	Strong Democrat	Other Party	Don't Know
Party Id	5.2%	12.3%	8.5%	9.5%	17.1%	16.6%	17.5%	3.3%	10.0%
	LT $15K	$15K-$25K	$25K-$35K	$35K-$50K	$50K-$65K	$65K-$80K	$80K-$100K	Over $100K	Refused
Family Income	9.5%	9.0%	10.0%	7.1%	7.6%	8.5%	12.3%	27.5%	8.5%