Intracultural Variability and Problem-Solving

by

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Abstract

When people pursue similar goals with similar means, it is reasonable to suppose that the constraints of the problem exert pressures toward conformity and response homogeneity. In extreme cases, conformity among successful problem-solvers is literally guaranteed because some problems have unique solutions, e.g., the coding-breaking problem "DONALD + GERALD = ROBERT" (where each letter stands for a different integer from 0 to 9, and D = 5). Few natural situations, however, exert such stringent constraints on possible solutions, with the consequence being that intracultural variability is quite common in problem-solving situations. Reasons for this include: (1) Sometimes a problem permits several satisfactory solutions; these may differ in terms of the resources or skills necessary for implementation. (2) Sometimes the very nature of a problem fosters multiple optimizing strategies among competitors. (3) Sometimes people acting in the "same" situation, from an observer's viewpoint, are actually pursuing multiple and different sets of goals. (4) Sometimes actors prefer different solutions simply because they have framed the same problem to themselves differently. And, (5) some problems are dilemmas, i.e., they have no known solutions. Thus, even when people of similar cultural and personal backgrounds are trying to solve very similar problems, we should expect to find intracultural variability, manifest as inter-individual differences and/or cognitive pluralism. The paper uses ethnographic examples, drawn principally from commercial fishing, to illustrate these points and suggests that variability is as much a fact of cultural systems as is conformity.

Introduction

The papers in this session are all dealing in one way or another with the theme of “intracultural variability.” I will be focusing on how intracultural variability arises in the context of human beings trying to solve problems. Before we get to the problem-solving part, however, let’s get a little perspective on this business of variability.

Here’s one of my favorite anthropological aphorisms. It comes from Kluckhohn and Murray (1953:53):

> Every human is in certain respects
> a. like all other humans.
> b. like some other humans.
> c. like no other human.
> * d. all of the above.

The correct answer, of course, is ... D, all of the above. It is the second line, however, that we focus on most of the time. How is it that every human is in certain respects like some other humans (and not like some others)?

Several kinds of groupings are commonly used to distinguish among people. There are different CULTURAL TRADITIONS around the world, or at least anthropologists like to talk this way. A psychologist would likely think of PERSONALITY TYPES before thinking of cultural variation. Biological anthropologists would note RACIAL GROUPS, or at least statistical bundles of clinally distributed traits. Linguists would think of LANGUAGE GROUPS. Sociologists emphasize groupings based on situational commonalities, especially similar ROLES in different social systems. (A bureaucrat in Grenada is in certain respects more similar to a bureaucrat in Germany than she is to a fisherman of her island home.) And so on.

Note, however, that all such groupings are abstractions. Cultures, personality types, races, languages, roles -- they are all simplifications of the true nature of human variability. Every human being resembles, to greater or lesser degree, every other human being. When we classify these resemblances, we create illusions of homogeneity within groups because we are emphasizing differences among groups. Thus, all the standard ways of dividing people into kinds mask considerable within-group variances. Periodically, we remind ourselves that our abstractions are deceiving us.

The very expression “intracultural variability” is just such a reminder for social anthropologists, and every so often it serves as the banner for a special issue (American Ethnologist 1975) or a session such as this one. Unfortunately, the expression -- intra[within]CULTURE -- presupposes that “cultures” are well-defined, identifiable entities in the first place. But, as Galton and Flower noted in 1889, if the notion of a culture makes much sense, then we should be able to enumerate how many cultures there are.

As far as I can tell, there is only one culture: human culture (in the sense of Barnes’s, 1971, critique of Murdock). And, and it consists of all the socially transmitted acquired traits of our species (in the sense of Boyd and Richerson 1985). In this view, then, intracultural variability is the only kind of cultural variability there is.

Problem-solving is a particularly interesting context in which to study intracultural variability. (By “problem,” I mean a consciously recognized situation in which one must answer a question or find a solution.) It is precisely in the context of problem-solving that cultural inheritance collides with free-will, where habitual ways of behaving (or “habitus,” Bourdieu 1977) become subject to direct attention and modification, where one’s accumulated past encounters the present while looking to the future.

When people pursue similar goals with similar means, it is reasonable to suppose that the constraints of the problem exert pressures toward conformity and response homogeneity. This is a major aspect of Goldenweiser’s (1913) “principle of limited possibilities.” In extreme cases, conformity among problem-solvers is guaranteed because some problems have unique solutions. For example, the following code-breaking problem has a unique solution, and anyone who solves it must make use of similar reasoning processes:

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    D O N A L D          Where each letter represents a different integer
  + G E R A L D          between 0 and 9, and D = 5.
    -----------------
    R O B E R T          [ see Appendix A for an illustrative solution ]
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(F. Bartlett’s example cited in Gladwin, 1970:226-227)

Few natural situations, however, exert such stringent constraints, with the consequence being that intracultural variability is quite common in problem-solving situations. Most times, “there is more than one way to skin a cat.”

What I’d like to focus on for the rest of this paper is five kinds of problem situations in which intracultural variability does arise. That is, kinds of problems where constraints on human behavior exist, but these are not sufficient to engender homogeneity. I illustrate each problem type with one or more specific examples drawn from commercial fishing.

Five Kinds of Problem-Solving Situations in which Intracultural Variability Can Arise

SITUATION I

> *Sometimes a problem permits several functionally equivalent solutions. If these alternatives do not differ in terms of their costs or pre-requisite resources, then individual preferences should be subject to rather free variation. Alternatively, if the solutions entail different resources (such as learned skills or financial costs), then these resource pre-requisites are likely to explain individual preferences.*

To illustrate this first kind of problem-solving situation, I'd like to use one of the most psychologically intense and recurrent problems facing skippers of commercial fishing boats: deciding where to fish. I shall be using different aspects of this general problem to illustrate several points.

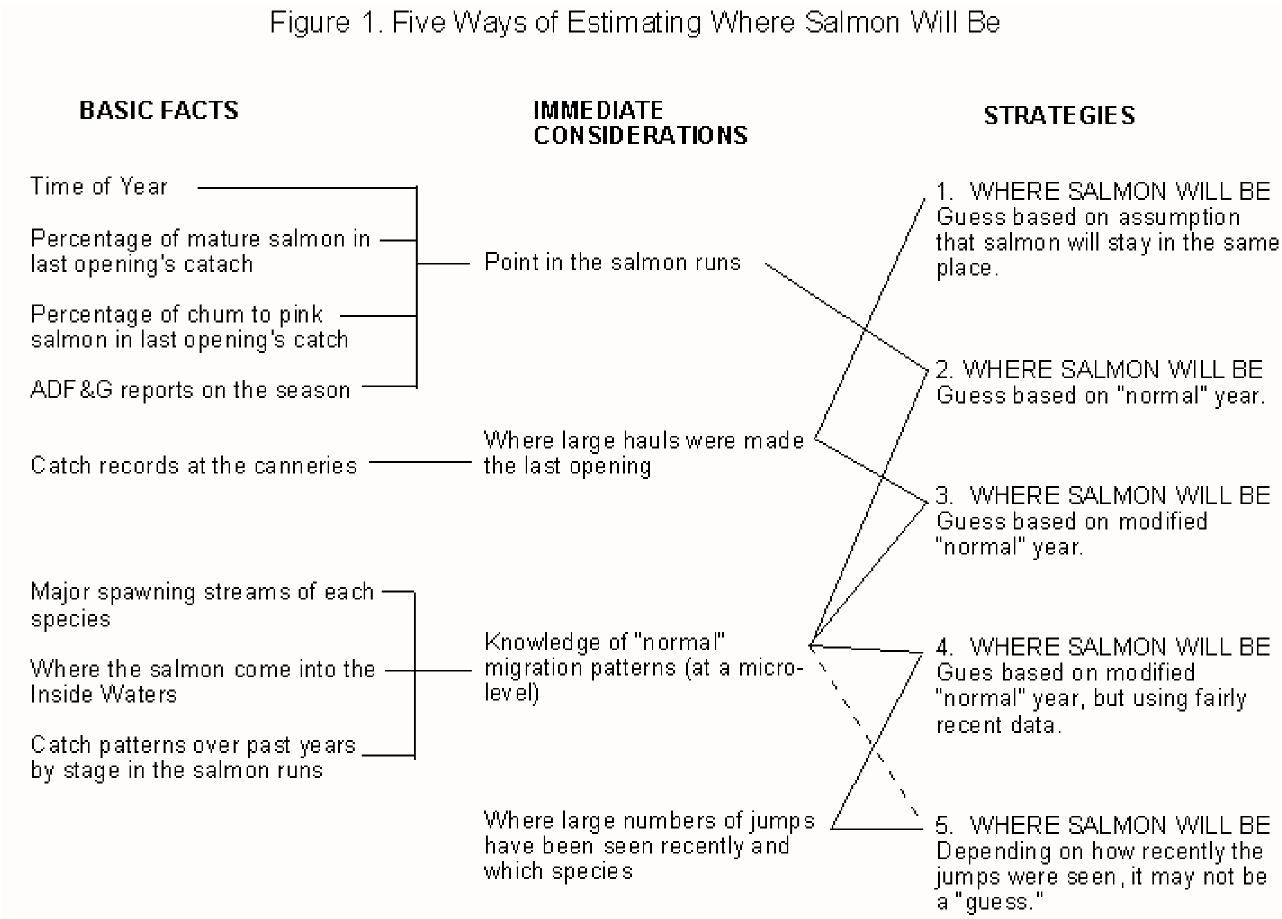
In the context of Alaskan salmon seining (ethnographic baseline is the mid-1970's), the 'decide where to fish' problem breaks down into several sub-problems. Upon hearing of an upcoming opening (legal fishing time), the first thing skippers do is try to evaluate the open areas in terms of several considerations (Gatewood 1983:358-359). One of the more important of these is how many salmon will be in each area when the opening begins. This sub-problem is what I want to focus on for the moment: How do skippers estimate the location of moving salmon several days into the future?

One might think that, if all the skippers are trying to estimate where the salmon will be, they would go about doing this the same way. But, skippers do not handle the problem the same way. Not only do they come up with different answers to the same question, but there are at least five strategies used to solve the problem, and each one uses different sorts of information (see Figure 1).

The first method demands the least skill. After each opening, a skipper finds out where the big catches were made, then simply goes there the next opening.

The second method presumes salmon movements follow a stable, "normal" year; hence, if one can ascertain what point the salmon runs are at, he or she can predict where fish might be. This solution would work well if the salmon runs developed the same way each year and if skippers had perfect knowledge of salmon migratory patterns. As neither supposition is true, however, this is generally regarded as a poor strategy.

The third, fourth, and fifth methods are similar in that they exploit a skipper's acquired understanding of salmon migratory patterns at a very fine-grained level in conjunction with recently updated information concerning salmon whereabouts to predict the location of moving salmon into the future. These three strategies differ in the quality (recency) of the initial state data (salmon whereabouts) from which they predict.



(diagram from Gatewood 1983: 361)

Before going on, there are two points to make. First, skippers trying to solve the same problem have devised five solution strategies. Not only do skippers differ in their estimations, but in how they estimate, i.e., there is intracultural variability at the level of strategies. Moreover, these strategies differ in what knowledge and information -- a kind of resource -- is pre-requisite to their implementation. Only the first and fifth methods do not require some prior knowledge of salmon migration patterns; hence, a novice skipper could use either of these, but not the second, third, or fourth. By contrast, experienced skippers could us any or all of the five procedures.

Second, this particular estimation problem has given rise to two kinds of intracultural variability: inter-individual differences (associated with a novice to expert gradient) and cognitive pluralism (expert skippers can and do employ several of the strategies when evaluating areas open to fishing).

Continuing on, note that the third, fourth, and fifth strategies all require information concerning salmon whereabouts -- each strategy predicts movements from fluctuating initial conditions. Getting such information presents a second problem, particularly if skippers want the most recently available information (requisite for strategies 4 and 5). Again, there are several functionally equivalent solutions to this.

1. Cooperate with one's competitors in a temporary information-sharing clique.
   A small group of cooperating boats can scout all open areas and closer to the beginning of an opening than one boat can, and with lower fuel costs per boat (Gatewood 1984:363; see Wilson 1990 for a more general theory of clique formation in fishing). But, this strategy is not available to those without an appropriate and pre-existing social network with other skippers in the fleet.

2. Get information from friends who troll for salmon (different technology for catching salmon).
   Salmon trollers go out from port for weeks at a time, cruising about with baited hooks dragging behind. Given that trollers catch predominantly cohos and kings (rather than pinks, dogs, and reds, which are the mainstays of seiners) and that they are essentially scouting all the time, seine skippers who can tap into the trollers' grapevine can obtain excellent information at minimal costs. While many seiners may recognize this as a good idea, again, it requires a well-established social network.

3. Hang out at the local ADF&G office the days before an opening and smooze with the officials there.
   The ADF&G has its own paid corps of fish observers who report back to their home office. Thus, a skipper who is friendly with the local officials base his evaluations of open areas on what these government officials tell him. There are potential social costs to this strategy, however. First, skippers who hang out at the ADF&G office run the risk of being seen as "one of Them" (as opposed to "one of Us") by other fishermen. Second, skippers who use only this technique of gathering information would either be regarded as inept at their job (if catches are average or below average) or suspected of wrongdoing and collusion with public officials (if catches are above average).

4. Use a seaplane to scout areas from the air.
   This relatively hi-tech solution is available to virtually all skippers in Alaska, but it has two obvious drawbacks. First, renting or buying a seaplane entails considerable direct financial costs. Second, it is not at all clear that the information obtained from fly-byes is as good as information obtained from slow, surface scouting.

This second specific example also shows how intracultural variability can arise. Here, again, we have a problem that permits several functionally equivalent solutions, and preferences among the alternative solutions are related to the different pre-requisites or costs of each. Further, although the few skippers who opt to use seaplanes are pretty much excluding the other options (can't be in two places at the same time), well-connected local skippers can use the first three tactics in conjunction. Thus, both inter-individual differences and cognitive pluralism are evident in ways skippers try to obtain information on salmon whereabouts.

In summary, even in these situations where people from similar backgrounds are trying to solve the same problems we find limited intracultural variability rather than homogeneity. Moreover, the variability is manifest both as inter-individual differences and as cognitive pluralism.

SITUATION II

Sometimes the very nature of a problem fosters multiple optimizing strategies among competitors. In such cases, we should expect to find intracultural variability resulting from adaptation at the systemic level.

Individuals in open-access commercial fisheries are generally in competition with one another. The most common reasons for this are: (a) fish one person catches are not available for others to catch; (b) how much fish others catch generally affects the price each person receives for his or her own catch; and (c) particular fishing locations can be overcrowded (too many boats in the same vicinity delay, interfere with, or take fish away from each other). In other words, fishing is not simply a matter of humans plying strategies vis-a-vis fish. Fishing involves humans plying strategies towards fish and other humans. How other fishers solve the problem affects the payoffs to one's own solution.

Viewed in this light, the 'decide where to fish' problem never really has a single, stable, optimal solution. If, for example, everybody decided where to fish based just on where they thought fish would be in greatest abundance, then those areas would be overcrowded, hence, no longer optimal (Gatewood 1984:361; Durrenberger and Palsson 1986:228). More generally, if everyone recognizes a given locale as optimal, it will cease to be optimal for the simple reason that everyone converges on it. By this sort of perverse reasoning, we can see that intracultural variability in solving the full 'decide where to fish' problem is actually adaptive. Everyone in the fleet does better if they don't all make the same final choice.

This general way of thinking has been developed very nicely in two papers concerning fishing, one by David White (1989), the other by Peter Allen and Jaqueline McGlade (1986).

White's micro-ethnography of the Alabama shrimp fishery describes the patterns of temporary fleet formation and dispersal and identifies eight types of skippers by their attitudes toward finding shrimp and fishing near other boats. Although his statistical evidence is only suggestive, he found that fishermen who use other boats' whereabouts to guide their own choice of fishing location did a little better on average than those who shunned other boats. (Folk wisdom is that boats with their gear in the water must be catching something.) But, the very fact that some skippers are "Trailblazers" and set off on their own works to advantage of all.

Allen and McGlade developed a sophisticated computer simulation to evaluate different patterns of discovery and exploitation in Nova Scotian groundfish fishery. The model includes two fish species and two types of skippers -- information-driven "Cartesians" and random-searching "Stochasts". In the simulation, fleet composition and information-flow between and among skippers had significant consequences on overall productivity and resource abundance of the fishery. In particular, the simulation results showed that (1) a homogenous Cartesian fleet leads to disastrous consequences for the system as a whole; (2) a homogenous Stochast fleet may or may not achieve a successful pattern of exploitation; and (3) a mixed fleet of Stochasts and Cartesians generally achieves balanced exploitation, provided there is some information-leakage from the Stochasts to the Cartesians (Allen and McGlade 1986:1196-1198).

These examples illustrate situations that have no single, stable, optimal solution. Indeed, successful adaptation at the level of the fleet seems to rest upon intracultural variability among the skippers. In such cases, then, variability is not merely a matter of free variation among functionally-equivalent alternatives, but rather the adaptive outcome of competition among the problem-solvers.

SITUATION III

> *Sometimes people acting in the "same" situation, from an observer's viewpoint, are actually pursuing rather different sets of goals or the same goals but with different motives. Differences in these extraneous goals and motivations can influence preferences regarding solutions to the original problem. That is, broader contextual aspects of a problem can give rise to intracultural variability, even when people from a the same cultural tradition are grappling with the same core problem.*

To illustrate of this kind of situation, let me again draw on Alaskan fishing. I've already talked about how participating in information-sharing cliques is one of the ways to solve a problem (where are the fish?). Let us now consider why some skippers who have the requisite social resources may choose not to participate in such arrangements.

Although I have made much of the 'decide where to fish' problem, it is important to remember that skippers have other duties to discharge, other fish to fry. They must keep their boats in repair, navigate rocky waters, hire and fire crew members, maintain crew morale, deal with other skippers and fish-processing personnel, and so forth. Being "skipper" involves a good deal of impression management, and there are different styles of enacting the role, particularly vis-a-vis their crews.

Some people play the skipper role as an authoritarian leader. They issue commands, seldom consult with their crews, and generally keep their thoughts to themselves. They aspire to an image of silent competence. Others play the role as a democratic leader, preferring consultation and open discussion of issues with their crews and other skippers. They project the image of a rational person struggling with difficult problems (Gatewood 1983:352-354).

Participation in an information-sharing clique -- which necessarily involves face-to-face discussions of important issues within earshot of crews -- has different side-effects for different kinds of skippers. Whereas joining a clique has no special disincentives for a democratic or moderately authoritarian skipper, an extremely authoritarian skipper may feel the open discussions would erode the image he has cultivated vis-a-vis his crew (Gatewood 1984:364). In other words, even though democratic and authoritarian skippers share a desire for recent information concerning salmon whereabouts, the full complex of motives for democratic and authoritarian skippers is not identical. In consequence of these peripheral motivations, extremely authoritarian skippers are less likely to participate in information-sharing cliques that are democratic types. The problem for democratic types is simply getting the desired information. The problem for authoritarian types is getting the desired information and in a way that does not undermine their image of silent competence.

In a related vein, it is interesting that information-sharing cliques do not form when the canneries have imposed catch quotas on the boats. Canneries impose quotas for mundane pragmatic reasons (the fleet's catch is greater than processing capacities), but an unintended effect is a subtle shift in fishers' motivations.

The quota is calibrated on the presumption that virtually all the boats will catch the specified amount. Hence, when quotas are in effect, the presumption is that fish are so plentiful that each skipper should be able to find fish through his own devices. Efforts to activate the information-sharing cliques under these altered conditions would be seen shameless admissions of dependence on others, because there is no obvious way that sharing information would be mutually beneficial in the now highlighted prestige gaming among skippers. In consequence, the information-sharing cliques are active only preceding normal openings (no quotas). Then the pride that inhibits the formation of coalitions can be submerged without penalty in favor of any reasonable effort to catch more fish (Gatewood 1984:365).

Note, however, that skippers need information concerning salmon whereabouts whether there are quotas or not. Quotas do not affect this core problem; it remains the same problem either way. What quotas change is the preferred way of solving the problem.

In summary, these two related examples illustrate how intracultural variability can arise when people trying to solve the same core problem are influenced by peripheral, contextual factors. In the first case, authoritarian and democratic skippers differ in their impression management sub-goals, and these sub-goals affect their preferred ways of discovering where the fish are. In the second instance, the same skippers who prefer information-sharing under normal conditions opt for another strategy under quota conditions. Phrased as generalities, the examples remind us that (a) problem-solvers are people, too; and (b) problems occur in some larger context.

SITUATION IV

> *Sometimes people prefer different solutions simply because they have framed the same problem differently. Which solution one prefers can vary depending on how the problem has been framed subjectively.*

Research in the psychology of choice has shown that few humans respond just to the "objective" characteristics of a situation when making their decisions. The raw mathematical expectations inherent in problems seldom predict accurately the human response. There are several factors that lead humans to respond in surprising ways (surprising in comparison with mathematically expected outcomes). The particular effect I want to talk about here is the "Framing Effect" discussed by Amos Tversky and Daniel Kahneman.

> Imagine that the U.S. is preparing from the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

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[positive framing]

If PROGRAM A is adopted, 200 people will be saved.
If PROGRAM B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
Problem = Which of the two programs would you favor?

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[negative framing]

If PROGRAM C is adopted, 400 people will die.
If PROGRAM D is adopted, there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.
Problem = Which of the two programs would you favor?

- - - - - - - - - - - - - - - - - - - -

(Tversky and Kahneman 1981:453)

Please note, first, that the mathematical expectation of the risky prospect in each paired-choice problem is equivalent to the outcome promised by its alternative sure prospect. That is, the mathematical expectation of the RISKY Program B is: (1/3 * 600 saved) + (2/3 * 0 saved) = 200 saved, or the outcome of SURE Program A. Second, note that Program A and Program C are merely different framings of the same mathematical outcome: 'saving 200 of the 600 who would die otherwise from this disease' amounts to the same thing as saying '400 people will die from this disease.' Similarly, the risky prospects B and D reduce to the same essential outcome (1/3 chance of the program working perfectly and 2/3 chance of program being completely ineffectual).

In fact, people do not respond to these two framings of the problem equivalently. In a sample asked to choose between Programs A and B, Tversky and Kahneman (1981:453) found that 72% favored Program A, versus 28% who favored Program B (n=152). That is, when the programs were phrased positively -- as a matter of saving lives -- most people were risk-aversive, preferring the sure prospect over its risky alternative. But, in a another sample asked to choose between Programs C and D, only 22% chose the sure promise of Program C, compared with 78% who chose the risky Program D (n=155). When choosing among negatively phrased outcomes, most people were risk-seeking in order to avoid a sure loss.

Here, then, is a kind of problem whose preferred solution seems to depend simply on how the problem is framed. When framed as a matter of saving lives, people are generally risk-aversive -- take the bird in hand rather than the birds in the bush. But, when the same outcome conditions are framed as people dying, people generally prefer to take risks in order to avoid a sure loss. Tversky and Kahneman call this sort of reversal of preference the "framing effect," and numerous experimental studies have demonstrated its robustness.

Note also that the framing effect can be, and has been, used to hood-wink consumers. For example, when gasoline companies wanted to recover administrative costs associated with credit cards, they decided to do this by charging credit card customers a little more than cash customers. But, they phrased the new policy -- involving a price per gallon discrepancy -- as a "cash discount" rather than a "credit card surcharge."

Unlike experiments in psychology labs, the situations confronting us in everyday life often allow, even require, individuals to frame a problem themselves. And, to the extent that individuals have some latitude in the framing of outcomes, intracultural variability in responses to the same problem will undoubtedly arise.

I don't know any research to back me up, but I suspect the framing effect underlies intracultural variability in three ways:

1. Individuals probably differ in their statistical tendencies to frame situations positively or negatively.
2. Individuals vary within themselves over time as a function of overall mood state (when I'm down and blue, I tend to see half-empty glasses, but in moments when Polyanna makes sense, those same glasses look half-full).
3. The most common way in which the framing effect comes up in everyday life is in situations where we have some latitude with respect to regarding a problem simply on its own terms or regarding it as one in a series of events. In such instances, the key question is whether (a) we feel our present circumstances are okay or neutral, or (b) we feel are "losing" relative to some reference point or reference group. For example,

> Imagine Sally has spent an afternoon at the race track, and has already lost $140. She is trying to decide whether to place a $10 bet on a 15-to-1 long shot in the last race...
>
> If she regards the bet strictly on its own terms (i.e., evaluates it from a history-neutral, adjusted-to-current-circumstances reference point), then she would frame the prospects and their outcomes as follows:
>
> DON'T BET: neutral, i.e., win nothing, lose nothing.
> MAKE BET: a. 1 / 15 chance of WINNING $140; and
> b. 14 / 15 chance of LOSING $10.
> Likely decision = don't bet long shots.
>
> If, however, she regards the bet from the perspective that she is "down $140 for the betting day" (i.e., evaluates the bet from an unadjusted, beginning-of-the-day reference point), she will frame the last race as a 1-in-15 chance to avoid losing $140 versus a 14-in-15 chance of losing another $10 and ending up $150 down for the day.
>
> DON'T BET: LOSE $140.
> MAKE BET: a. 1 / 15 chance of LOSING NOTHING; and
> b. 14 / 15 chance of LOSING $150 (lose another $10).
> Likely decision = bet long shots to get out from under.
>
> (Tversky & Kahneman 1981:456)

The point is that people who do not adjust their reference point as they lose are more likely to take bets they normally would not. This is because they are evaluating prospects from a "domain of losses" perspective, which encourages risk-seeking to avoid sure losses (Tversky and Kahneman 1981:456). Incidentally, bets on long shots are, indeed, most popular on the last race of the day, despite folk sayings admonishing such a practice, e.g.,

- “Don’t throw good money after bad.”
- “Never count your money while sitting at the table. There’ll be time enough for counting, when the dealing’s done.” (Kenny Rogers’s song ‘The Gambler’)

The relation between one’s reference point and the framing effect offers interesting insight into some kinds of intracultural variability, particularly some so-called ‘class-related psychological traits.’ For instance, several anthropologists (e.g., Oscar Lewis, George Foster) have noted the propensity of people living in poverty to gamble. Similarly, studies of who plays the state lotteries in the U.S. have shown that poorer folks tend to play more than do wealthier folks. These patterns of intracultural variability with respect to risk-taking behavior are explicable as follows. When one knows that he or she is “poor” (not doing as well as others), doing nothing translates as losing; hence, one will be inclined toward risk-taking as a means of avoiding a sure loss (staying the same). Conversely, when people feel they are doing well, they will be inclined to evaluate prospects from a neutral or “domain of winning” perspective, i.e., be risk-aversive.

In the fishing literature, John Cove (1973) mentions risk-taking differences among Newfoundland trawler skippers. According to Cove, skippers at the top of a company’s catch hierarchy are less risk-taking in their decisions of where to fish than are skippers further toward the bottom. His finding contradicts folk wisdom -- that highliners become so by their willingness to take risks -- but makes sense in terms of how reference point influences risk-taking. High ranking skippers would be in a position to evaluate options using a neutral reference point (hence, be inclined toward risk-aversion), but low ranking skippers have “nothing to lose” and would be evaluating options from a domain of losses perspective.

To reiterate, the general point of these examples is that one’s social position and reference group can influence his or her preferences in choice problems. Even one’s mood state can influence preferences. In such cases, intracultural variability is systematically related to differences in the ways people frame problems to themselves.

SITUATION V

> *Sometimes a problem presents a dilemma, i.e., it has no known solution and yet requires choices to be made. In such cases, although the sense of problem may loom large and cause considerable angst, the problem per se exerts little constraining influence on subsequent decisions and behaviors.*

In the case of Alaskan salmon seining and many other mobile-gear fisheries around the world, the ‘decide where to fish’ problem presents a dilemma of this sort, i.e., a problem that has no realistic solution. Although skippers are able to gather information and establish preferences among different fishing areas in terms of one concern at a time, there is no clear procedure to follow when trying to synthesize all the considerations and make the final choice (Gatewood 1984:359-362).

Suppose Skip [a hypothetical skipper] tries to organize his thoughts about the fishing areas in an orderly way. The different fishing areas might be represented as rows in a matrix, and Skip’s primary considerations (number of fishing places, crew ability & morale, travel time & costs, number of other boats, and salmon abundance) are the columns. To fill in the matrix, Skip expresses his evaluations of the areas in the form of rank-ordered equivalence classes, e.g., Areas A and E are equally best in terms of fishing places (see Figure 2).

Figure 2. Two Procedures for Integrating Multiple Rankings

AREAS	Fishing places	Crew ability	Travel costs	Other boats	Salmon abundance	OPER. I	OPER. II
A	1	2	1	2	2	8*	8**
B	3	2	1	1	3	10	18
C	4	2	3	3	3	15	216
D	2	1	1	4	1	9	8**
E	1	3	2	1	4	11	24
F	3	1	4	2	2	12	48
G	1	1	4	1	2	9	8**

* Where to Fish (operation I) = Minimum Row Sum
** Where to Fish (operation II) = Minimum Row Product

So far, so good. Skip's dilemma becomes apparent, however, when he tries to synthesize his rankings across the columns and choose his "best" place to fish. Addition across the columns (minimum row sum) makes no sense: it would be adding 'apples and oranges,' and it presumes each consideration is equally important with all the others. Multiplication is also undefined because the numbers within each column are only preference rankings, i.e., the difference between a "1"-ranking and a "2"-ranking may not be as great as that between a "2"-ranking and a "3"-ranking.

Now, one might suggest that Skip express his evaluations of open areas in terms of 10-point scales (i.e., do ratings instead of equivalence class rankings) and assign weighting coefficients to the columns. These procedural modifications would enable familiar arithmetic operations. But, they are ridiculous "unnatural acts" in this context, for Skip's evaluations are made under extreme uncertainty, and at least he has the good sense to recognize this fact. It is difficult enough for him to establish rank-ordered equivalence classes.

Thus, after considerable time and effort expended in gathering relevant information and evaluating open areas in terms of several important concerns, Skip still has no clear-cut way to make his choice. This is the skipper's dilemma (Gatewood 1983). Although his efforts may have eliminated some areas, his final choice is under-determined by his initial considerations. Skip's final choice of fishing location, thus, has a random element; it is not completely "information-drive" (in the sense of Allen and McGlade 1986). To the extent that this random element increases diversity among skippers' final choices, it has adaptive consequences for the fleet as a whole (see discussion of Situation III, above), but for skippers as individuals, the dilemma spawns visible angst.

A second example of a fishing problem with no realistic solution comes from Nova Scotian herring purse seining. Since the development of electronic "fish finders," skippers can detect fairly accurately the size of a herring school in the water. Given that once the net is cast, the boat is committed to an hour or two of work and cannot go chasing after other schools that may appear on the scope, what is the smallest school of herring that one should mess with?

Some skippers favor a “hard work” answer to this question. That is, they have low thresholds and will set their nets on schools as small as 10 tonnes. Because there are relatively many small herring schools, the hard-work, low-threshold-strategy advocates stay busy most of the time. Other skippers think “patience” is the essence to catching fish, i.e., they cruise around patiently until a large school (e.g., 50 tonnes) comes in sight.

It can be shown via computer simulation that each distribution of herring schools has a single optimum threshold strategy (Gatewood and Mace 1990). But, in the naturally-occurring context of herring fishing, there is no way to determine which threshold strategy actually works best. Skippers are aware that different boats catch different amounts of fish and that skippers differ in their preferred threshold strategy. But, looking only at catch records, there is no way to isolate the effect of threshold strategy from alternative explanations for differential catch, such as FISHING LOCATION, SKILL at working one’s gear, and LUCK. As these four factors are hopelessly confounded in the historical catch data, skippers’ preferences for different threshold strategies persist.

In both of these examples, intracultural diversity is a by-product of insolvable problems. Skippers decisions of where to fish are under-determined, producing a rather stochastic, free variation based on idiosyncratic whims. In the case of Nova Scotian threshold strategies, there is a persistent range of opinion even though a single optimal strategy exists for a given distribution of herring schools.

Conclusion

So, what might we learn from the foregoing examples? There are a few points I think worth repeating:

1. Even when people with similar backgrounds from the same ‘culture’ try to solve similar problems, we should expect to find intracultural variability rather than homogeneity.

2. To the extent that problems do constrain solutions, problem-solvers will show limited variability rather than random, free-variation.

3. Intracultural variability refers not only to diversity of answers to problems, but often to strategies or procedures for coming to answers.

4. Intracultural variability takes two forms: **inter-individual differences** and **cognitive pluralism** (in the sense of a repertoire of alternatives within the same individual).

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Appendix A: Solution to Code Problem

```
   D O N A L D        Where each letter represents a different integer
+  G E R A L D        from 0 to 9, and D = 5.
   -----------------
   R O B E R T
```

Initial observation: The largest quantity that can be carried from one column to the next is “1” because the largest sum any column can be on its own is 17 (9+8).

Given D = 5 and D + D = T …

a. T = 0.

Since O + E = O and only “1” can be carried from column to column, either O = 9 or E = 9. But, since the only way O could equal 9 is if E also equaled 9, i.e., 9 + 9 + 1(carried) = 19, E must equal 9 …

` b. E = 9.

Since we carry 1 to second column, and any number plus itself produces an even number, R must be an odd number. However, we’ve already eliminated 5; R cannot be 1 because L cannot = 0 [T = 0]; R must be greater than 5 because D(5) + G(>0) = R; and R cannot equal 9 (E = 9). Hence …

c. R = 7.

Since D = 5 and R = 7 and 1 is being carried to that column from O + E, then …

d. G = 1.

Since L + L + 1(carried) = R and R = 7, L must equal 3 or 8. But, since A + A = 9 (an odd number), L + L + 1(carried) > 10; therefore …

e. L = 8.

Since A + A + 1 carried = 9, A = (9-1)/2 …

f. A = 4.

N cannot equal 2, because then B would equal 9 (and E = 9). N cannot equal 3, because then B would equal 0 (and T = 0). Therefore, by elimination …

g. N = 6.

Since N = 6 and R = 7 …

h. B = 3.

By elimination of all other possibilities …

i. O = 2.

Summary:		
	G = 1	N = 6
	O = 2	R = 7
	B = 3	L = 8
	A = 4	E = 9
	D = 5	T = 0