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R. Scott Tindale

Loyola University Chicago

Tatsuya Kameda

Hokkaido University

Verlin B. Hinsz

North Dakota State University

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Groups as decision-making bodies have been afforded a special status in society from at least the times of the early Greek civilization that developed democratic voting structures. This special status remains in tact in most societies and cultures today. Legislatures decide which bills to pass into law; juries decide the guilt or innocence of defendants and the amount of damages awarded to plaintiffs; school boards decide how to structure the curricula used to teach our children; sales teams decide how to market new products; corporate boards decide which investments are warranted and which person should serve as CEO. Although individuals make many decisions in both the public and private sector, the truly important decisions are generally assigned to groups.

Groups are seen as superior to individuals as decision-making entities for at least two reasons. First, groups can represent a larger and more diverse set of perspectives, constituencies, etc. Thus, they tend to be seen as more fair by providing "voice" or input from a greater portion of the body for which the decision is made (Darley & Tyler, this volume; Folger, 1977; Thibaut & Walker, 1975; Tyler & Smith, 1998). However, groups are also perceived as "better" than individuals at making important decisions (Paulus, Dzindolet, Poletes, & Comacho, 1993). The idea that "two heads are better than one" is widespread and typically accurate, based on the empirical record (Hastie, 1986; Hill, 1982; Kerr, MacCoun, & Kramer, 1996a; Laughlin & Ellis, 1986). Although social psychological research has focused on both the fairness and performance of group decisions, the main focus of this chapter will be on the latter. We will highlight some of what is currently known about how groups reach consensus on decision-making/problem-solving tasks, and how such consensus processes affect the quality or accuracy of the final group response. Because the field is far too large to do a complete review of the literature, we will focus on only those theories and studies that we feel best represent the current state of affairs.

Much of the early work on group decision-making focused on individual member preferences as the legitimate inputs for group choice (Kameda, Tindale, & Davis, 2002). This work stemmed, in part, from the political and economic work on "social choice theory" (Arrow, 1963; Black, 1958; Grofman & Owen, 1986). In social psychology, the seminal work by Lorge and Solomon (1955) spawned a number of general models of social combination processes that could be used to predict the final group outcome from member preferences (see Davis, 1973; 1996; Hinsz, 1999; Kerr, 1981; Laughlin & Hollingshead, 1995; Penrod & Hastie, 1981; Shiflett, 1979**;** Stasser & Davis, 1981; Steiner, 1972). However, more recent work has begun to view groups as information processing systems (Brauner & Scholl, 2000; Hinsz, Tindale, & Vollrath, 1997; Larson & Christensen, 1993). As such, many recent models have begun to view cognition as an additional legitimate level of aggregation (Gigone & Hastie, 1996; Ickes & Gonzalaz, 1994**;** Larson, Foster-Fishman, & Keys, 1994; Stasser & Titus, 1985; 1987; Stasser & Stewart, 1992).

Hinsz et al. (1997) defined information processing at the group level as "the degree to which information, ideas, or cognitive processes are *shared* or are *being shared* among the group members …" (p. 43 – italics added). Kameda, Tindale, and Davis (2002) argued that "social sharededness" is a multi-level phenomenon that can be used to understand group decision making at both the preference (response) and information (cognitive) level. Kameda et al. argued that the degree to which preferences and/or information were "socially shared" was a key aspect to understanding group decision processes and outcomes. In essence, they argued that things that are shared among most or all of the group members exert an extraordinary influence on group decision processes and outcomes. Tindale and Kameda (2000) extended the idea of social sharedness to a variety of group characteristics besides preferences and information – e.g.,

group identities, mental models, metacognitions, etc. (see also Tindale, Meisenhelder, Dykema-Engblade, and Hogg, 2001).

In the current chapter, we review the work on group decision-making using a "social sharedness" theme. We attempt to show that much of the literature can be understood in relation to sharedness at one of three levels: preferences, cognitions, and metacognitions. At each level, the degree of sharedness is important for understanding both how groups reach consensus and on the decision alternative or judgment position on which the group finally decides. In addition, sharedness on different levels can interact to affect both group process and performance. Although social sharedness is a fairly recent theme in the small groups literature, it provides a framework for both understanding much of the current literature and for guiding future research endeavors. Thus, after reviewing the literature in terms of socially shared preferences, cognitions, and metacognitions, we outline some potentially fruitful avenues for further investigation.

Socially Shared Preferences

Social Decision Scheme Theory

As stated above, the central problem for early work on group decision-making was how individual member preferences are aggregated into a final group choice. In line with the social-choice-theory tradition in economics and political science (e.g., Arrow, 1963; Black, 1958; Sen, 1977), these works regarded individual preferences as a main locus of group interaction, and focused on how those preferences change over time and are combined to yield a final group consensus (Kerr, 1981; Penrod & Hastie, 1981; Stasser & Davis, 1981).

Among these approaches, probably the most comprehensive conceptual system for describing group aggregation processes is Davis' Social Decision Scheme (SDS) theory (1973,

1996; Stasser, Kerr, & Davis, 1989). SDS theory assumes that small group interaction can be seen essentially as a *combinatorial process*, in which preferences for decision alternatives across group members are combined in such a way as to allow the group to reach consensus on a single group choice. The combinatorial process appears to vary as a function of the group task, environment and other factors. SDS theory provides a formal way to probe the aggregation process that best summarizes the group interaction in a given setting or context. In this analysis, candidates of combinatorial processes that may operate in the decision setting are represented as stochastic matrices called decision schemes (Davis, 1973).

For purposes of illustration, suppose a six-person jury is working on a criminal case. As shown in Table 1, there are 7 distinguishable preference-patterns that those 6 jurors may array themselves over guilty and not-guilty verdicts (6G-0NG, 5G-1NG, …, 0G-6NG), prior to group interaction. Table 1 provides a matrix representation of two simple group-aggregation models, referred to as "social decision schemes"; *proportionality* and *majority-equiprobability-otherwise*, that may characterize group aggregation process in this case. Each element of the matrix represents the conditional probability that a group with a specific preference pattern (e.g., a jury initially composed of 2 guilty-sayers and 4 not-guilty sayers) decides on an alternative (guilty or not-guilty) for a group-aggregation model. The proportionality model assumes that the probability that a group will choose a particular alternative is the proportion of members favoring that alternative. The majority-equiprobability otherwise model presupposes that whenever a majority of the members favor a particular decision alternative, the alternative will be chosen by the group. In cases where no majority exists (a 3G–3NG split), then any alternative selected is equally likely to be the group's choice. Thus, the proportionality model assumes that factions within the group are only as powerful as the relative size of that faction, whereas the majority-

equiprobability otherwise model assumes that majority factions are quite powerful and typically define the group's choice.

Insert Table 1 about here.

Representing various group-aggregation models as stochastic matrices, SDS theory allows a systematic investigation into which aggregation model best describes the actual consensus process in a given setting. More technically, by using the multinomial theorem (see Davis, 1973; Kameda et al., 2002 for details), SDS theory provides a prediction about how group decisions should distribute over choice alternatives (e.g., probabilities of guilty and not guilty verdicts in the criminal case) *if* a given aggregation model describes the actual consensus process reasonably well. Then, the predicted group-outcome distribution is tested against observed distributions of group decisions. For example, the predictions from the two aggregation models presented in Table 1 could be compared against observed data to assess which model better accounts for the data (see Davis, 1996; Kerr, Stasser, & Davis, 1979; Stasser, 1999; Stasser et al., 1989 for a comprehensive reviews of SDS theory).

The SDS approach has generated a large body of research addressing how groups reach consensus in a variety of decision situations (see the 1999 special issue of the *Organizational Behavior and Human Decision Processes*, Vol. 80(1), for a summary of recent developments using this approach). Although a number of factors have been found to influence group decision processes (Davis, 1982; Laughlin, 1980), one of the more consistent and robust findings from this research has been that majorities/pluralities "win" most of the time. This is particularly true when no demonstrably correct alternative exists (Laughlin & Ellis, 1986). When groups cannot

demonstrate that a particular alternative is empirically or axiomatically correct (or optimal) during discussion, "correctness" tends to be defined by consensus, and larger factions tend to define the group consensus. Majority/plurality type aggregation has been observed to describe the consensus process of groups working on a variety of decision tasks/situations, including mock juries (Davis, Kerr, Atkin, Holt, & Meek, 1975; Kameda, 1991, 1995; Kerr & MacCoun, 1985; MacCoun & Kerr, 1988; Tindale & Davis, 1983), risk taking (Davis, Kameda, & Stasson, 1992; Davis, Kerr, Sussman, & Rissman, 1974; Kameda & Davis, 1990), recognition memory performance (Hinsz, 1990), choice of political candidates (Stasser & Titus, 1985), reward allocation decisions (Tindale & Davis, 1985), and hiring job candidates (Kameda, 1993; Tindale, 1989).

Social Judgment Schemes

One of the limitations of the general SDS approach is that it is primarily applicable to preferences defined by *discrete* decision alternatives. Although many important decision-situations involve discrete choices (e.g., to promote or not), groups are often required to render numerical responses, as exemplified by a budget committee, a civil jury deciding on a compensation award, etc. (Davis, 1996; Hinsz, 1999). SDS theory is ill suited for continuous response formats (Hinsz, 1999). Recently, Davis (1996) formulated a social judgment schemes approach for continuous judgments that is analogous to the SDS approach, which has many of the same properties discussed above for majority/plurality models (see also Hinsz, 1999, for an alternative SDS approach for responses of a quantitative nature and Gigone & Hastie, 1996 for a social judgment theory model for continuous responses). The Social Judgment Scheme (SJS) model is based on position discrepancies (distance among preferences) along the response continuum among the members of a group. The model assumes that group's decision, *G*, is a

weighted sum of the r members preferences, x_j, $j = 1, 2, ..., r$, where c_j is the weight of the jth member. That is

$$G = c_1x_1 + c_2x_2 + ... + c_rx_r .$$

Given that the members' preferences can be observed a priori, only the weights must be defined further. The consensus weight of the jth member depends on the *centrality* of the member's position relative to other members of the group. The closer that member's position is to other members' positions, the more weight that member is given in defining the group consensus. Thus, the weight of the jth member is defined by

$$c_j = \frac{\sum_{j'=1}^{r} f(|x_j - x_{j'}|)}{\sum_{j=1}^{r}\sum_{j'=1}^{r} f(|x_j - x_{j'}|)}$$

In the above equation, the social influence function, f, is defined as

$$f(|x_j - x_{j'}|) = \exp[-\theta(|x_j - x_{j'}|)], \quad j \neq j'$$

where θ is a positive constant. In practical applications of the model to date, $\theta = 1.00$.

This model tends to give little if any weight to the most discrepant member of the group and fairly heavy weight to the most central member(s). Even though factions per se cannot be defined, the group decision tends to be defined mainly by members who are similar (in proximity along the response dimension) to each other, at the expense of members whose positions are fairly discrepant. Thus, the SJS model essentially assumes a dominant role of central members (i.e., social sharedness) in guiding consensus, much like the majority/plurality models discussed above. The model has fared well in recent empirical tests (Davis, Au, Hulbert, Chen, & Zarnoth, 1997; Hulbert, Parks, Chen, Nam & Davis, 1999; Ohtsubo, Masuchi, & Nakanishi, in press).

Macro consequences of consensus processes guided by socially-shared preferences

As we have seen above, group aggregation processes tend to be guided by the sharedness of the member preferences when the demonstrability of a preferred solution is low. This is seen as initial majorities or pluralities in a discrete choice situation, or by members whose opinions are mutually close (i.e., central in the group) in a continuous judgment case. In other words, the degree of *social-sharedness* in members' preferences at the onset of interaction plays a critical role in determining final consensus outcomes. Although this observation may seem quite natural on the surface, such consensus process guided by *shared preferences* may bring about rather counter-intuitive phenomena at the macro level. We discuss two of such macro phenomena below: group polarization and manipulability of group decisions.

Group polarization. In the June 1994 British elections for the European Parliament, the Labor Party, the Conservative Party, the Liberal Democratic Party obtained 44%, 28%, and 17% of the *votes*, and acquired 70%, 20%, and 2% of the *seats* respectively in the parliament. The Labor Party, which was relatively advantageous in terms of the number of votes obtained, won the landslide victory in terms of the final seats in the parliament. The electoral system used in this election was a single-seat constituency system coupled with a *plurality* rule.

As readers correctly guess, consensual decision-making guided by initial majorities/pluralities produces exactly the same accentuation effect at the group level (Hinsz et al., 1997). To illustrate, let us imagine a hypothetical investment decision-making situation. There are 3 choice-alternatives that can be ordered in terms of their risk levels -- low risk, moderate risk, and high risk. Suppose that an *n*-member representative committee, randomly chosen from some population, is to discuss this investment issue to make a final decision. We assume that consensual decision-making in this committee is essentially governed by a

majority/plurality process as mentioned earlier. Figure 1 displays distributions of individual preferences in the population and theoretical distributions of group decisions assuming a simple majority/plurality process.

Insert Figure 1 about here.

As can be seen in the figure, it is clear that the risky alternative that is most dominant at the individual level (i.e., population level) becomes more dominant at the group level (accentuation), whereas the other weaker alternatives become even weaker at the group level (attenuation). For example, the most popular, high-risk alternative is supported by 60% of the individuals in the population. The theoretical probability that this alternative is adopted as a group choice is amplified to 68% in a 5-member committee and to 73% in a 9-member committee. On the other hand, the least popular, low risk alternative (supported by only 10% of the individuals) is adopted as a group choice only 0.8% of the times in the 5-member committee and 0.08% in the 9-member committee. The change in choice probabilities from the individual level is more evident with the increase in group size, as can be seen from the comparison between 5- and 9-member groups.

It is interesting to note that such an accentuation in the micro to macro transformation never occurs if group aggregation is summarizable as a proportioality process (cf. the left panel of Table 1). If proportinality governs consensus process in the representative committee, the distribution of group choices should be identical to the distribution of individual preferences. Furthermore, although the above illustration used a discrete choice case, the same argument applies to a continuous judgment case. If the process predicted by the SJS model characterizes

group aggregation in the committee, any skewness in the population distribution of individual preferences toward a particular end of a response continuum would be exacerbated in the group response distribution, due to the higher likelihood of committee members having preferences in the smaller tail. In contrast, a simple averaging process in the committee should yield exactly the opposite effect, viz., a *less skewed* distribution at the group level than at the individual level. The group polarization phenomenon, which is observed widely in social decision-making beyond risky situations, was a vigorous research topic in social psychology in the 70's. Although several individual-level explanations have been proposed (Vinokur & Burnstein, 1974; Sanders & Baron, 1977), notice that our view of this phenomenon focuses on the social aggregation process. Consensus process affected by social sharedness (e.g., a majority/plurality or a SJS-like aggregation) can theoretically produce polarization or distributional shifts at the group level even when there is no attitude, preference change in individuals due to social interaction. Thus, individual attitude change is not a necessary condition for group polarization (see Davis, 1973**,** Davis & Hinsz, 1982**,** and Lamm & Myers, 1978 for a further discussion on this point).

Besides its obvious political implications (Kameda, Hulbert, & Tindale, 2002), these group polarization phenomena are also important in relation to decision accuracy. Suppose that a group decision task triggers some "cognitive bias" (cf. Kahneman, Slovic, & Tversky, 1982). If there is no external evidence proving why biased preferences are wrong, and/or if members lack logical or statistical backgrounds to understand those corrective arguments, then consensual processes would essentially be determined by shared preferences at the outset of interaction. Then, the quality of group decisions should depend on what kinds of preferences are shared at the outset in a given group stochastically. In this sense, the probability of an individual member's "biased" preference is key. If this individual probability is larger than a critical social

threshold (e.g., 50% in the case of a simple majority process), then consensual decision-making leads groups astray. Improvement by grouping is expected only when the individual bias-proneness is smaller than the social threshold (Kerr, MacCoun, & Kramer, 1996a, 1996b). Furthermore, as can be seen in the comparison of 5- and 9-member groups in Figure 1, increasing group size accentuates such a group polarization tendency even further. Using a larger group means that the variance of group-decision qualities is also enlarged statistically – either a great success or a fiasco, depending on the degree of individual bias relative to the critical social threshold in a focal context.

Manipulability of group decisions. Another important implication of consensus process guided by shared preferences is procedural manipulability of group outcomes (Davis, 1992). The most famous example of this sort, focusing particularly on majority/plurality aggregation, is Condorcet's voting paradox. When a group decides among 3 or more alternatives (say *x*, *y*, and *z*), "cyclical majorities" can exist. For example, if members' preference orders are *x*>*y*>*z*, *y*>*z*>*x*, and *z*>*x*>*y* respectively in a 3-person group, the majority in the group prefers *x* over *y*, *y* over *z*, and *z* over *x*. (Notice that the "majority consists of different members in each preference.) Thus, cyclicity (intransitivity) exists in the preferences of majority members. In such a situation, the group choice outcome via majority rule depends on a particular path by which pairwise votings are conducted i.e., *path-dependency* of voting. For example, if one's first preference is *x*, he/she can guide group decision toward the alternative by first calling for a vote between *y* and *z*, and then a vote between its winner (*y*) and *x*. Obviously, a chairperson who can choose which voting order to take can potentially manipulate the group decision outcome to personal advantage (see Black, 1958; Mueller, 1989 for further discussion of paradoxes of voting).

Although the example above is taken from a voting situation, manipulability may also play a substantive role in consensual decision-making. For instance, Kameda (1991) demonstrated such a procedural manipulation in a situation where a group needs to consider several key conditions to render a final decision. An example might be investment decision-making, in which several key criteria must be satisfied to make a final investment decision. Two contrasting discussion procedures are conceivable in these situations. In the *compound* procedure**,** the chairperson solicits members' overall conclusions from the outset, encouraging members to express their overall preferences -- to invest or not. In contrast, the *elemental* procedure takes the opposite approach, focusing on collaborative evaluations of the key criteria; the chairperson asks for members' judgments of each of the conditions respectively. Although these two procedures are both plausible and seemingly neutral, the choice of a procedure substantially impacts on final group outcome, as illustrated in Table 2.

Insert Table 2 about here.

Table 2 displays a hypothetical opinion configuration of 3 members working on the investment decision task. We assume that there are two key conditions to be satisfied to make the investment and that person A serves as a chairperson of this committee. While member A personally prefers to invest, the other two members do not. Therefore, provided that the consensual process is guided by a majority process, member A has little chance to prevail, if the discussion centers on exchanging members' *preferences* ("compound procedure"). However, what if member A adopts the elemental procedure instead? Assuming that each member is faithful to his/her original judgments, the same majority process should yield a positive

collective judgment for each of the two criteria, allowing the chairperson to conclude the discussion with investment decision.

It can be shown formally that the probability of investment will *always* be higher with the elemental procedure as compared to the compound procedure. In the example above, the elemental procedure can theoretically increase the probability of a decision to invest by the maximum margin of .13 for a 3-person group, .23 for a 6-person group, and .37 for a 12-person group, compared to the compound procedure. Thus, the elemental procedure is more advantageous to a chairperson, if the person personally desires investment; if personally preferring not to invest, the compound procedure should serve the chair's interest. Using 4- and 6-person groups, Kameda (1991) confirmed that consensus outcomes can be manipulated procedurally as illustrated above. Even when a group was instructed explicitly to discuss the issue until they reach a *unanimous* agreement (i.e., majority voting was thus discouraged), the two procedures affected consensus outcomes as implied by the formal model. Furthermore, no members were aware of the manipulation; group outcomes were essentially accepted as fair and satisfactory (cf. Darley & Tyler, this volume; Lind & Tyler, 1988).

As illustrated in this example, the social process guided by shared preferences makes the voting paradox a central issue for consensual decision-making that lacks an explicit formal voting procedure. In a similar vein, continuous group decisions can also be guided toward a particular individual's personal advantage through a procedural manipulation tactically utilizing social sharedness. Although space does not allow us to discuss them here, various forms of such procedural influences have been studied in the small-group decision-making literature, including effects of sequential straw polling (Davis, Stasson, Ono, & Zimmerman, 1988), local majorities (Davis et al., 1989; Kameda & Sugimori, 1995), consensus rules (Davis, Kerr, Atkin, Holt, &

Meek, 1975; Miller, 1989), and agenda setting (Davis, Tindale, Nagao, Hinsz, & Robertson, 1984; Stasson, Kameda, & Davis, 1997). (See Davis, 1992, Davis, Hulbert, & Au, 1996, Kameda, 1996, and Kameda, Hulbert, & Tindale, 2002 for further discussion on procedural influence on consensual decision-making.)

Socially Shared Cognitions

Shared Information and the Common Knowledge

Although much of the early work on group decision making focussed on preferences, some exceptions did exist (Graesser, 1982; Vinokur & Burnstein, 1974). Probably the best-known early attempt to understand groups at the cognitive level was Vinokur and Burnstein's Persuasive Arguments Theory. In an attempt to explain group polarization, Vinokur and Burnstein argued that for any given issue, there is a population of arguments associated with it. They also argued that group discussion could be seen as members sampling arguments from that population. If there were more and/or more persuasive arguments favoring positions on one end of the response continuum, then the sample of arguments would favor that end and would lead group members to move in that direction, producing group polarization. One of the key assumptions of the theory was the importance of unshared or unique arguments (Vinokur & Burnstein, 1978). They assumed that shared arguments would have little impact when brought up during discussion because everyone already had that information. In contrast, they argued that unshared or unique information would affect member preferences and was crucial for polarization to occur.

More recent research has demonstrated exactly the opposite in that shared information dominates discussion and determines decisions. Stasser and Titus (1985) designed a paradigm for studying the effects of shared and unshared information on group decision making that had a

major impact on the field of small group research. The paradigm has been referred to as the *hidden profile* technique and the basic finding has been called the *common knowledge effect* (Gigone & Hastie, 1993**,** 1996). Stasser and Titus had four-person groups choose one of three political candidates based on information profiles about the candidates. In some of the groups, all members were given complete information about all three candidates. However, in other conditions, some information was shared by all members and some information was only held by individual members. With complete information, most individuals typically preferred a particular candidate (e.g., candidate A). However, in the hidden profile (unshared information) condition, the positive information about candidate A was divided among the group members while the negative information about A was shared. This led individual members to prefer some other candidate at the beginning of discussion. Even though the groups, with a thorough discussion, should have been able to discover that Candidate A was optimal, this rarely happened. Most of the groups chose an alternative candidate, and the group discussions contained mainly shared information. In addition, a majority model tended to describe the group decision processes at the preference level.

Stasser and Titus (1987) showed that a simple information-sampling model could account for the above effects. Research has shown that the likelihood of a piece of information being recalled by a group is a function of the number of members presented with that information (Hinsz, 1990; Tindale & Sheffey, 2002; Vollrath, Sheppard, Hinsz, & Davis, 1989). Thus, shared information is more likely to be recalled than unshared information at the group level. In addition, even with perfect recall, the probability that a piece of information gets brought up is also a function of the number of members who have it (Stasser, Taylor, & Hanna, 1989). Based on these assumptions, Stasser and Titus (1987) formulated their information-sampling model.

The model (based on Lorge and Solomon's (1955) model A for predicting group problem solving outcomes) basically assumes that the probability, *p(D)*, that a given piece of information will be discussed is 1 minus the probability that no one mentions the item during discussion. This can be mathematically described as $p(D) = 1 - [1 - p(M)]^n$, where *p(M)* is the probability of any given member mentioning an item that he/she has, and *n* is the number of members having that item. When only one member knows a given piece of information *p(D) = p(M)*. However, as *n* increases, so does *p(D)* so that shared information will always have an advantage over unshared information in terms of it entering into the discussion content.

Gigone and Hastie (1993, 1996), using a rather different paradigm, demonstrated similar findings and shed additional light on the processes underlying the common knowledge effect. Gigone and Hastie used a multi-cue judgment task, and varied whether the cues were shared or unshared among the group members. Each group made multiple judgments so Gigone and Hastie could assess the degree of importance each cue had for predicting individual member and group judgments. Consistent with the Stasser and Titus (1985) findings, shared cues were more important for predicting group judgments than were unshared cues, with importance generally being a linear function of the degree of sharedness. Interestingly, cues that were actually brought up during discussion did not increase in weight as a function of their being mentioned. In addition, the effects of the cues on group judgments were totally mediated by the member preferences. Thus, it seems that the distribution of information in the group (i.e., information or cognitive sharedness) influences group judgments only indirectly through member preferences (i.e., preference sharedness) (though see Winquist & Larson, 1998 for an exception).

Although very robust and often replicated (see Wittenbaum & Stasser, 1996 for review), the common knowledge effect can be attenuated by some procedural mechanisms. Larson,

Foster-Fishman, and Keys (1994) have shown that unshared information becomes more prevalent in group discussion over time. Thus, extending the discussion time of groups should help insure that unshared information gets brought up during discussion. However, the opposite seems to happen when time pressures are put on the group. Groups focus on fewer alternatives and place more emphasis on shared information when under time pressure (Janis, 1982; Karau & Kelly, 1992; Kelly & Karau, 1999). Recent work by Parks and Cowen (1996), Sawyer (1997) and Sheffey, Tindale, and Scott (1989) has shown that allowing group members to have access to informational records during discussion can attenuate hidden profile effects. Sawyer (1997) also found that instructing group members not to form a priori judgments helped to reduce the effects, although this has not always been found to be effective (Sheffey et al., 1989).

Stasser and Stewart (1992) found that framing the task as a problem to be solved (implying a correct answer) led to greater sharing of unshared information during discussion. More recently, Postmes, Spears, and Cihangir (2001) found that priming groups with a norm to think critically led to greater information sharing and better performance than groups primed with norm to reach consensus. In addition, Hollingshead (1996) showed that having group members rank order decision alternatives rather than simply choosing one increased the sharing of unique information and the discovery of hidden profiles. Finally, Stewart and Stasser (1995) demonstrated that assigning roles associated with the information distribution (e.g., "you are the expert on candidate x") led to more discussion of unshared information, but only when the roles were known by all of the group members (see section on shared metacognition below – also see Stasser & Birchmeier, 2002, for a more thorough description of methods for reducing the common knowledge effect).

Shared Information and Member Influence – Cognitive Centrality

Work on the common knowledge effect has focused on the effect of shared information or knowledge per se on consensus. Little emphasis has been placed on group *members'* status or power as a function of degree of knowledge-sharing with other members. For example, one member may share a substantial amount of information with other members, while another member may share only a portion of it. Because shared information has a greater impact on final group decisions, it seems likely that members having more shared information may acquire *pivotal power* in the group. This idea was tested in a set of studies by Kameda, Ohtsubo, & Takezawa (1997). Using a social network framework, Kameda et al. devised a model to represent the degree to which any given member was "cognitively central" in the group. Much like Davis' (1996) SJS model, which locates members' preference centrality, Kameda et al.'s measure of *cognitive centrality* defines members in terms of the degree of centrality in the *sociocognitive network*. The greater the degree of overlap between the information held by a given member and the information held by other members on average, the greater the degree of centrality for that member.

Kameda et al. (1997) ran two studies to assess whether cognitively more central members would be more influential in their groups, regardless of whether they were in minority or majority factions. In Study 1, they had three person groups discuss whether a defendant in a highly publicized trial deserved the death penalty. By coding contents of knowledge each member held prior to group interaction, they calculated a cognitive centrality score for each member in each group. They then used the members' cognitive centrality score to predict participation rates and opinion change after group discussion. Members' ranking in terms of centrality were positively related to their ranking in terms of participation. For members in

minority factions, their degree of centrality also predicted (inversely) their amount of opinion change, though centrality was unrelated to opinion change for majority members.

In Study 2, Kameda et al. manipulated the information given to each group member to create two different situations. In one condition, the most cognitively central member of the group was a lone minority (in terms of preference) against a two-person majority. In the other condition, the most cognitively central person was part of the two-person majority, with the minority member being the least cognitively central. When the minority person was most cognitively central, the group went with the minority position 67% of the time. When the minority person was most peripheral, the minority won only 42% of the time. In addition, groups were more confident in the conditions where the central minority person's preference was chosen by the group. Thus, being the most central person in the group allows that person a greater degree of influence, even when he/she is a minority in terms of preference. Kameda et al. (1997) argue that such an enhanced social power accrues from perceptions of expertise for the cognitively central member in the focal knowledge domain.

Shared Task Representations: Intellective vs. Judgmental Tasks

Research on the common knowledge effect tends to show that shared information plays a central role in group decision making. In addition, it shows that shared information and shared preferences tend to correspond with each other. Thus, the research on shared cognitions has tended to fit nicely with the work on majority/plurality processes. However, there are a number of instances in the small group literature where deviations from majority processes have been observed. Probably the most notable is the work by Laughlin and his associates (Laughlin, 1980; Laughlin & Ellis, 1986; Laughlin, 1996) on group problem solving. Problem solving (intellective) tasks are defined by Laughlin as tasks for which a "demonstrably correct solution"

exists, as opposed to decision making or “judgmental” tasks, where "correctness" tends to be defined by the group consensus (Kameda, et al., 2002).

A demonstrably correct solution is one for which the group members can "demonstrate" a particular alternative is correct or optimal during the group discussion. Research has shown that majority/plurality models tend to severely under-predict group performance on such tasks. Models such as "truth wins" or "truth supported wins" (where either one or two members, respectively, who prefer the correct alternative can win out over incorrect majorities) provide much better fits to experimental data (Laughlin, 1980). In defining demonstrability, Laughlin and Ellis (1986) argued that a key feature was a system of axioms or beliefs that were shared among the group members. This shared belief system serves as a background for the members understanding the logic behind the correctness of a given alternative. Thus, using the shared belief system, minority factions arguing for a correct alternative can win out over majorities favoring an incorrect alternative.

Laughlin and associates (Laughlin & Ellis, 1986; Laughlin, Bonner, & Altermat, 1998) have used the notion of demonstrability to explain how groups compare to individuals in terms of performance on both intellective and judgmental tasks. For judgmental tasks, majorities/pluralities tend to define the group decision process, so performance depends on whether the majority/plurality is correct. In such cases, groups may outperform the average individual, but they will not consistently perform at the level of their best members, and may perform considerably worse than even their average members on tasks where the correct answer is chosen infrequently by members (Tindale, 1993). However, for intellective tasks (i.e., tasks where some demonstrability exists), group performance should always be better than the average individual and should approach the performance of the group’s best member for highly

demonstrably tasks. Typically, groups perform about as well as their second best member on intellective tasks (e.g., "truth-supported"wins). However, Laughlin and Ellis (1986) showed that for highly demonstrable tasks (e.g., simple math problems) a truth wins model provided the best fit – which implies that groups performed at the level of their best member.

More recent work by Laughlin and colleagues (Laughlin, 1996; Laughlin et al, 1998; Laughlin, VanderStoep, & Hollingshead, 1991) has also shown that information load affects the degree to which groups perform as well as their best member. This work has focused on "collective induction" where groups attempt to generate hypotheses to explain available data. Laughlin (1996) has argued that such tasks involve both intellective and judgmental components. Distinguishing between plausible (consistent with current data) and implausible (inconsistent with current data) hypotheses is an intellective task, while choosing among several plausible hypotheses is more judgmental. Across several studies (Laughlin et al., 1991; Laughlin et al, 1998), they showed that groups performed at the level of their second best member when the amount of evidence (data) was not too substantial. However, with very high information loads (looking at five arrays of data or more), groups performed as well as their best member, and in a very recent study with a different high information load task, groups performed better than their best member (Laughlin, Bonner, & Minor, in press). Thus, level of demonstrability and information load both affect how well groups will perform relative to the performance of each of their members alone.

Laughlin's work shows that minorities advocating correct positions can over-ride incorrect majorities by using shared knowledge structures. Tindale, Smith, Thomas, Filkins, and Sheffey (1996) generalized this notion to more judgmental situations and argued that whenever a "shared task representation" exists, alternatives consistent with the representation will be easier

to defend and thus more likely to end up as the groups' collective choice. Tindale et al. define a shared representation as "any task/situation relevant concept, norm, perspective, or cognitive process that is shared by most or all of the group members" (p. 84). Task/situation relevant means that the representation must have implications for the choice alternatives involved, and the degree to which a shared representation will impact on group decision processes will vary as a function of relevance. Its impact should also vary as a function of the degree to which it is shared among the group members. If no shared task representation exists**,** or if multiple conflicting representations are present, then groups will tend to follow a symmetric majority/plurality type process. However, when one does exist, the group process will tend to take on an asymmetric structure favoring the decision alternative that is consistent with the representation. Thus, majorities or minorities favoring the alternative consistent with the shared representation will be more powerful within the group.

Although the work by Laughlin (1980) on group problem solving is the strongest example of effects of shared representations, a number of others also exist. For example, much of the work on mock jury decision making (Davis, 1980; MacCoun & Kerr, 1988; Tindale & Davis, 1983) has shown that "not guilty" is an easier verdict to defend than "guilty", which is consistent with the shared processing objective of looking for "reasonable doubts" given to juries in all US criminal cases. Thus, both majorities and minorities favoring not guilty are more powerful than comparably sized factions favoring guilty (Tindale, Davis, Vollrath, Nagao, & Hinsz, 1990). Tindale and associates (Tindale, 1993; Tindale et al., 1996) have also shown that shared decision biases or heuristics can produce similar deviations from symmetric majority processes. For example, Tindale (1989) showed that biased feedback procedures intended to produce conservative hiring or promotion practices allowed minorities voting against a job

candidate's promotion to win out over majorities favoring promotion. Tindale, She ffey, and Scott (1993) found that groups given the "loss" version of the standard "Asian Disease" problem (Tversky & Kahneman, 1981) would choose the riskier alternative even when a majority of the members favored the less risky alternative (see also Laughlin & Early, 1982). More recent work has shown that shared values (fairness - Krebel, Munier, Anderson, Meisenhelder, Dykema-Engblade, & Tindale, 2001) and shared motives (Morgan & Tindale, 2002) can work as shared representations as well.

Studies focused on how shared representations function has shown that they potentially operate in two different ways to affect group decisions. First, Smith, Tindale, and Steiner (1998), using a "sunk cost" problem, found that sunk cost arguments were persuasive, even if only a minority of members mentioned them as reasons for their decisions. Thus, arguments that are consistent with the shared representation can be especially influential in a group decision context. Second, a recent study by Tindale, Anderson, Smith, Steiner, and Filkins (1998), continuing a program of research looking at the estimation of conjunctive probabilities by individuals and groups (Tindale, Sheffey, & Filkins, 1990; Tindale, Filkins, Thomas, & Smith, 1993), videotaped the group discussions for conjunctive probability problems. Earlier research had shown that minorities making non-normative (“erroneous”) estimates were more powerful than majorities making normative estimates. The videotaped group discussions showed that groups rarely discussed strategies as to how to make the estimates, but rather simply exchanged information concerning their individual judgments. When groups went with a single member’s judgment as the group judgment, which occurred more than 60% of the time, they were more likely to endorse the judgment of an incorrect member for conjunction problems that typically led to errors. For conjunction problems that typically did not lead to errors, groups were more likely to

endorse the judgment of a correct member. These patterns were relatively independent of the preference distribution in the group. Thus, it seems that shared task representations can affect group decisions even when only preference information is exchanged. As long as a given individual preference is plausible within the shared representation, the group members will find it acceptable without thorough debate.

Shared cognitions come in various types and at various levels of generality (see Tindale & Kameda, 2000, and Tindale et al., 2001 for reviews). In addition, there are often several sets of shared cognitions present in groups. A limited amount of recent research has begun to compare how different types of shared cognitions affect one another. For example, Postmes, Spears, and Cihanger (2001) showed that giving groups a shared norm or processing goal oriented toward "critical thinking" as opposed to "reaching consensus" led to a reduction of the common knowledge effect. Thus, shared norms can moderate the affects of shared information. Shared identities can also influence the degree to which unique or novel ideas are tolerated in a group. When deviant behavior or ideas violate important ingroup norms, they are tolerated better when performed or proposed by outgroup as opposed to ingroup members (Abrams, Marques, Bowen, & Henderson, 2000; Phillips, 2000). Finally, Stasser, Stewart, and Wittenbaum (1995) and Stasser, Vaughn, and Stewart (2000) have shown that allowing group members to know which other members are "experts" in particular areas or what information other members have also attenuates the common knowledge affect. This type of "meta-cognitive" knowledge is the focus our next section.

Socially Shared Metacognition

The sharing of knowledge in groups making decisions can also be considered from a metacognition perspective. Metacognition refers to the ways we think about thinking (Jost, Kruglanski, & Nelson, 1998). We have discussed how group members may share cognition in

pursuit of a group decision. At a higher level, we can see metacognition as the ways that people think about the ways they process information and perform cognitive tasks. Using this definition we can also conceive of metacognition in groups: the ways group members think about the way they process and share knowledge in groups and the ways groups perform cognitive tasks (Hinsz, in press). For purposes of this chapter, we focus on higher-level processing of information on very complex cognitive tasks: decision-making. Consequently, we can consider metacognition in decision-making groups as how group members think about the ways they process and share knowledge in an attempt to reach group decisions.

There has been substantial research on metacognition for individuals (Metcalfe & Shimamura, 1994). Perhaps the most useful is that by Nelson (1992, 1996; Nelson & Narens, 1990). Nelson's (1996) model representing the processes involved in metacognition proposes object and a meta levels of analysis of cognitive processes. The object level reflects the processes of interest as they objectively occur. For decision-making groups, these would be the processes involved in sharing information and reaching consensus whereas the meta level reflects people's subjective views of how groups share information and reach consensus. Research in metacognition attempts to determine the accuracy of people's metacognition in comparison to the objective level. The actual content of the metacognition is also of interest. For example, what are the beliefs group members hold about the way their group reaches a decision (e.g., "committee meetings are a waste of time, we always choose what the chair wants, etc.).

According to Nelson's model, there are two important processes involved in metacognition. The monitoring process reflects the information gained about the activities at the object level (e.g., "Will we be able to reach a decision in the time allotted?"). The control process demonstrates the ways the respondent thinks about the decision situation (i.e., meta-level) to determine how to act (e.g., "We need to follow the agenda instead of going off on tangents."). If people have metacognition about decision making in groups, then it may be useful

to consider how they monitor and control the activities involved in group decision-making. Moreover, it might be fruitful to consider the metacognition for how groups share knowledge and process information in pursuit of reaching group decisions.

Metacognition for group decision-making refers to how people think about how groups make decisions. The more interesting instances arise for group members having metacognition about how their groups make decisions. Group members' metacognition for their own groups are of interest because the assumption is that the beliefs that group members have about their group are expected to influence the way the group members interact, which might influence the outcomes of those group interactions (e.g., group decisions; Hinsz, in press). Consequently, the metacognition that group members have for their groups has the potential to influence the decision-making processes and outcomes of groups.

Shared Objectives for Decision Making: Implicit and Explicit Agenda Effects

When groups try to reach a decision, they generally have a set of explicit and implicit objectives they hope to attain. These objectives reflect metacognitive beliefs that group members have about what the decision should be as well as the way the decision should be reached. Some members of the group will believe that the discussion should be an open and free exchange of information about the decision situation. Other members might believe that the objective is to reach a decision and focus on the response alternatives that are feasible. Hastie, Penrod and Pennington (1983) found that these two different types of objectives described the pattern of deliberation for mock juries in their research. They described evidence-driven juries as ones that focus on the evidence related to the crime and a discussion of its value and credibility. On the other hand, verdict-driven juries tend to try to determine whether the defendant is guilty or innocent, and discussion of the evidence is in support of one or the other alternatives. Hastie et al. demonstrated that the deliberation (e.g., time to verdict) and other features of the decision making process was influenced by whether the jury focused on evidence or the verdict.

A more explicit way in which objectives influence decision-making is in terms of the agendas that are used to guide the group decision-making process. As previously discussed, research indicates that the way the agenda is arranged can have remarkable influences on the decisions reached (Davis, et al., 1984; Kameda, et al., 2002**;** Levine & Plott, 1977). Implicit and hidden agendas can likewise influence the decision making process. Davis (1992; Davis et al., 1988) describes how a clever committee chair could arrange the polling of people about their preferences to influence undecided members to respond in a way consistent with the chair's initial preference. Both explicit and implicit agendas demonstrate that the expectations group members have for their decision-making groups are metacognitive beliefs about objectives that may control group interaction and decision outcomes.

Shared Metacognitive Beliefs about Groups: Shared Mental Models

Just as group members may have shared representations of tasks, they may also have shared representations of the groups of which they are members (Hinsz, 1995). Some of the research examining how group members think about how their group's function can be found in the shared mental models literature (Cannon-Bowers, Salas, & Converse, 1993; Hinsz, 1995, in press; Kraiger & Wenzel, 1997; Rentsch & Hall, 1994; Stout, Cannon-Bowers, & Salas, 1996**)**. Mental models reflect cognitive representations that people have of systems and the way they interact with those systems (Hinsz, 1995; Rouse & Morris, 1985). If we take the perspective that groups are complex, adaptive, and dynamic systems (McGrath, Arrow, & Berdahl, 2000), then mental models can be metacognitive representations of how their groups function and operate (Hinsz, in press). If group members have mental models of how groups deliberate and make decisions, these mental models may be predictive of how the groups actually deliberate and reach a decision. Important questions for the consideration of member mental models include whether they accurately represent the process of decision-making by a group and how shared these mental models are among the members of the group.

The accuracy of the mental model reflects the degree that the group members' beliefs about the way their group makes decisions accurately reflect the way their group actually makes decisions. Group members may have mental models of their group decision-making but they can be flawed in important ways such that they are inaccurate representations. Groups may have members acting with regard to the wrong decision situation, (Picken & Dess, 1998). Alternatively, if group members have accurate mental models about how their group should make decisions, then the members should act in ways that will produce better decision outcomes (Cannon-Bowers et al., 1993).

The sharedness of the mental models group members may have for decision making is another key question for the consideration of metacognitive representations (Cannon-Bowers, et al., 1993; Hinsz, 1995, in press; Hinsz, et al., 1997). If accurate mental models are shared, then there are a host of potential benefits for group decision-making. However, sharedness of mental models is not sufficient. It is important that the group members share accurate mental models. If group members share mental models of the way their group should reach decisions, there should be less disagreement among the members about the way to reach a decision. The group should be more efficient and effective in reaching a decision and the group members will believe that their group was effective and efficient in its use of time. Consequently, the members will be more satisfied with the decision making process and be more willing to participate in the group in the future (Hackman, 1987; McGrath et al., 2000).

Shared Memory and Remembering: Transactive Memory

Memory processes are one aspect of metacognition for decision-making groups that has received attention. Just as metamemory (how people think about how they remember and forget) has received attention for individual cognition, similarly the memory processes of decision-making groups has also attracted attention. In the case of decision-making groups, the metacognition questions concern how the group members think about the way their groups

remember and how this memory by the group influences decision making by the group. Substantial research has examined how memory by groups may influence decision- making (Clark & Stephenson, 1989; Hinsz, 1990; Stephenson, Clark & Wade, 1986; Stewart & Stasser, 1992; Vollrath, et al., 1989). These research efforts support the general assumption that the better memory of the group, the greater the likelihood the group will achieve a better decision (Vollrath, et al., 1989).

Some of the most relevant research on shared memory processes in groups concerns transactive memory (Wegner, 1987, 1995; Wegner, Erber, & Raymond, 1991). Transactive memory is based on how group members use and rely on each other in remembering material. Transactive memory reflects a set of strategies that group members can use to encode, store and retrieve information that will be used by a group. These strategies allow one person to focus on remembering specific information and other group members can later rely on this person to remember that particular information. As a consequence of these transactive memory systems, groups can remember more information in total than if they had not used a transactive memory strategy (Hollingshead, 1998).

For a group to remember some information, it is necessary for the group to place the information into some form of storage. A first question that a group would need to determine, probably derived from encoding, is whether the information should be stored at all. If the information is considered irrelevant for the group's purposes, then the controlling function of metacognitive processes would suggest that the information does not need to be stored by any group member. However, if the information is going to be stored, a set of tactically subsequent questions arises. An apparent aspect of memory in groups is that the group has many more memories than an individual acting alone (Hinsz, 1990). So, one metacognitive issue the group has to consider is who will store the information. Will the storage of the information occur for all the group members, indicating that the storage of the information is shared and redundant?

Alternatively, the group may decide that only one or a few group members will be responsible for storing the information. Assigning responsibility for storing the information to select individuals would be a transactive memory strategy that would allow the other group members to focus on other information to be remembered (Wegner, 1987). Research on transactive memory has found that the information is remembered better if the member(s) storing the information have interest or expertise with regard to the information content (Wegner, 1987; Wegner, Giuliano, & Hertel, 1985). These individuals with interest and expertise are likely to be able to represent the information in a more coherent fashion, and thus would be more likely to recall the information accurately when it is needed.

Transactive memory also suggests that the retrieval of information will be easier if the group members have good representations that allow the information to be encoded in a coherent fashion. These group members can then more easily retrieve the information. One transactive memory strategy would use members with specific expertise and interests as storehouses of information that is related to the group members' expertise and interest. From a perspective of metacognition, the group members would monitor the incoming information and identify information related to their arenas of expertise. When such information is brought forth, particular members control their memory processes to focus on remembering that information. The other members of the group would come to expect that group members would try to remember information related to their areas of expertise and interest (Wegner et al., 1991). Consequently, later, when specific information is needed to make a decision, the group members will turn to the member with the expertise to retrieve the desired information. If the transactive memory system increases the retrieval of relevant information, this should lead to improved group decisions.

Shared Rules for Decision Making: Social Decision Heuristics

The decision a group reaches is often based on selecting one alternative from some initial set of alternatives (Davis, Laughlin & Komorita, 1976). Thus, the group's definition of the initial alternative set is of utmost importance. Group members may not know all the feasible alternatives, and as such, may miss opportunities to choose the most appropriate alternative. For example, in many jurisdictions in the United States, a jury can decide that the law used to try a defendant does not apply in a particular case. The jury can disregard the evidence and return a verdict of not guilty (i.e., jury nullification; Horowitz, 1985). Consequently, the beliefs the group members share about the feasible decision alternatives limits the ultimate decision a group might reach.

Metacognition is important in how group members monitor their group's progression to a decision. The metacognitive process of monitoring could focus on the timeliness, quality (reasonableness), and acceptance of the group decision (Vroom, 1969). Some research has examined the ways groups progress to reach an agreement (Kerr, 1981, Goodwin & Restle, 1974; Hinsz & Saum, 1996). Group members and their leaders will likely monitor how well or poorly their group is doing in approaching a decision in a timely fashion. Similarly, group members may monitor quality during the group decision-making process by considering whether the decision meets the requirements and constraints of the decision situation. Group members also will be motivated to monitor the acceptance of the likely group choice. Members will note directly whether they endorse or accept the likely group decision. If they don't, they may engage in more vigorous discussion of the alternatives. The group members will also be concerned with the acceptance of the decision by external entities. If there is an audience or other collective to which the group will be held accountable in their decision, the group members will often consider and possibly discuss how this audience will respond to their likely choice (Tetlock, 1985). If the group believes the audience will disapprove of, negate, disavow, or overturn their

decision if they select a particular alternative (e.g., appellate court), the group may choose to move on to consider an different alternative that will receive more support from the audience, even if it is not the best decision overall.

Decision-making groups often engage in metacognitive strategies to control how they reach decisions. Earlier, agendas were noted to influence the processing objective, but agendas can also influence how a decision is reached. Standard operating procedures, bylaws, and constitutions of groups often dictate the rules used to control deliberation and determine the alternative selected. If a group chooses to follow Roberts' Rules of Order, they are applying a metacognitive strategy to control how discussion, deliberation, and debate will be held. Similarly, as we mentioned earlier, there may be rules determining how voting in the group is conducted, which will often dictate the decision rule that is applied (e.g., majority wins).

Group decision-making research has considered group decision rules (Miller, 1989). Some of this research has focused on the group decision rules that are considered best by the group members (Miller, 1989). Other research has focused on the decision rules that will produce the best group decision outcome (Grofman & Owen, 1986). Furthermore, other research has examined decision-making groups to determine the implicit decision rules that groups appear to use when trying to reach a decision (Davis, 1973, 1980, 1992). One finding from this research is that the preferred, best, and implicit group decision rules vary greatly as a function of the decision situation. Decisions that are considered important to the group members appear to require higher levels of agreement among the group members before a decision can be reached. Alternatively, unimportant decisions, or ones for which group members have difficulty advocating strongly for a specific alternative, seem to require much less agreement (Hinsz, 1990; Hinsz, et al., 1997; Laughlin, 1980).

One of the characteristics of the application of decision rules in groups is that they generally vary in terms of the degree of consensus required to lead to the selection of an

alternative. From a metacognitive perspective, the consensus requirements are generally known and applied by group members. However, another interesting question that arises is the origin of these metacognitive beliefs about consensus requirements? The emergence of evolutionary social psychology may provide a basis to consider this question (Buss & Kendrick, 1998; Simpson & Gangestad, 1998).

An evolutionary psychology perspective may suggest that conflicting opinions are inherent in any social group facing decisions (Latane & Bourgeois, 2001). Because of the differing experiences, knowledge, and capabilities, group members will necessarily come to the group with some divergent opinions about the proper group response to a decision situation. These divergent opinions are contrary to the agreement that is necessary for the group to proceed in its efforts. Consequently, from an evolutionary perspective, social groups should develop ways to resolve these differences of opinion. Moreover, the members of the group would need to be motivated to resolve these differences. Hence, we should find that differences of opinion should make members of tight-knit groups perceive that conflict exists (Festinger, 1964). This perceived conflict would lead to the experience of negative, unpleasant arousal which group members would be motivated to reduce (Matz, 2001). Hence social groups would inherently carry with them the divergent opinions leading to conflict as well as the pressures to uniformity that will lead to the resolution of the differences (Latane & Bourgeois, 2001).

The evolutionary perspective here only suggests that social groups, such as decision making groups, should be motivated to find ways to reduce the conflict, but that the specific conflict resolution and consensus attainment procedures could be unique to different aggregates and societies. Cross-cultural research could explore whether the negative, unpleasant state associated with conflicting opinions in a group are universal, even though the means of resolving these disagreements are particular to groups and cultures. Our consideration of the implications

of evolutionary psychology and the potential of cross-cultural research suggest that many additional directions for research on group decision making exist.

Social Sharedness: Where Can We Go From Here?

Group decision-making and adaptation

This chapter has focused mainly on group decision performance. Although group decisions often fail to achieve optimal levels of performance due to various process losses (Steiner, 1972), on balance, the notion of delegating important decisions to groups is favored by the research evidence. Interestingly, such reliance on decision-making groups is not necessarily limited to industrialized, "democratic" societies, but is observed in more traditional, tribal societies as well. Anthropologist Boehm (1996) surveyed the ethnographic literature about how tribal societies make decisions, especially in crisis situations. Decisions about raiding and warfare made by Mae Enga living in highland New Guinea, provide a prototypical example. In such crisis situations, the Big Man of Mae Enga calls for a tribal meeting composed of adult males, and solicits public responses without offering his personal opinion (Meggitt, 1977). His role is rather like a chairperson of the meeting, basically adopting an alternative endorsed by a majority of the group as the tribe's decision. Three other ethnographic records reviewed by Boehm (1996) converge with this observation.

Such ubiquitous roles of decision-making groups in various human societies, ranging from tribal to highly industrialized societies, leads us to contemplate the *adaptive or evolutionary functions* achieved by group decision-making (Barkow, Cosmides, & Tooby, 1992; Campbell, 1994; Caporael & Baron, 1997). As Boyd & Richerson (1985) and Wilson (1997) have argued, group decisions, or any other social mechanisms that bind individual behaviors (such as social norms or conventions: cf. Henrich & Boyd, 1998; Kameda, Takezawa, & Hastie, submitted; Kameda, Takezawa, Tindale, & Smith, 2002) decreases variability of individual fitness *within* a

group, while increasing the variability *across* groups. Because individuals belonging to the same group behave in essentially the identical manner due to these binding mechanisms, their levels of fitness are similar within the group, but may greatly differ from those belonging to other groups. Then, group decision making, as a representative binding mechanism in human societies, might have played a specific role in hominid evolution, because it enhances the chance that the *group* functions as a unit of natural selection. It is usually argued in evolutionary biology that natural selection operating at the group level may be theoretically possible but weak enough to be ignored. However, the common usage of group decision-making in human societies may add a unique feature, increasing the chance of a meaningful impact of group-level selection in hominid evolution (see Wilson & Sober, 1994; Sober & Wilson, 1998 for a comprehensive argument on multi-level selection in evolution).

Evolutionary thinking highlights various adaptive issues associated with group decision-making. For example, why does social sharedness matter so much at various levels in guiding group consensus? Why do people tend to endorse group decisions, even if their personal preferences are not reflected in the decisions directly? We have revealed *proximate* causes to answer these questions, but the *ultimate* causes (Barkow et al., 1992) behind these phenomena are still largely unknown. Recently, several researchers have launched projects related to these questions. For example, Sorkin and his colleagues (Sorkin, West, & Robinson, 1998; Sorkin, Hays, & West, 2001) examined adaptive efficiencies of group decision making under noisy environmental conditions. Based on the signal-detection framework, these researchers developed a model of how group performance depends on the group size, the competence of members, correlation among members' judgments, the constraints on member interaction, and

the group's decision rule. In particular, they showed that a simple majority rule often achieves quite efficient performance in group decision-making.

A similar approach has also been taken by Kameda & Hastie (in preparation). Stimulated by recent work on "fast and frugal heuristics" in individual decision-making (Gigerenzer, Todd, & ABC Research Group, 1999), they examined adaptive efficiencies of various group decision rules under uncertainty by a series of computer simulation. Implementing a stochastic environment where the property of adaptive target is known only probabilistically through several proximal cues (cf. Hammond, 1996), Kameda & Hastie conducted a systematic evaluation of various group-level decision rules or heuristics. The results indicated that, despite being fast and frugal in terms of necessary computation, majority rule is fairly robust against random noises, missing information, etc., and consistently outperforms other decision rules. Together with the Sorkin et al. studies, these results provide one, though still incomplete, answer to why majority rule based on shared preferences may operate so strongly in consensus groups (see also Henrich & Boyd, 1998; Kameda & Nakanishi, submitted, for adaptive basis of conformity in groups). Extending such an adaptive perspective to the functioning of social sharedness at other levels, viz., shared cognition and shared metacognition, seems a promising future direction, which may link social psychological work on group decision making to evolutionary anthropology (Boyd & Richerson, 1985; 1996) and evolutionary biology (Dugatkin & Reeve, 1994) in an integrated manner.

Dynamical Systems, Social Sharedness and Group Decision Making

Another area with potential relevance to small group decision-making, and social sharedness, is dynamical systems theory (Vallacher & Nowak, 1994). Much of the past work on small group decision-making has tended to focus on linear, antecedent-consequence type

relations with manipulations of independent variables (e.g., group size, task type) seen as causing changes in dependent variables (e.g., group choice, implicit decision rule). Although this approach has taught us much about group decision-making, its very nature focuses attention on one or a few variables while ignoring virtually all others. In addition, even relatively short discussions leading to a decision involve multiple exchanges along numerous dimensions. Each member speaks, listens, looks, laughs, frowns, agrees, disagrees, etc. and each action can affect, and is affected by, each and every other action. In groups with longer durations (e.g., teams, corporate boards), these factors vary over time and are affected by characteristics of the specific members, the group, and the social/institutional context (Arrow, McGrath, & Berdahl, 2000).

The dynamical systems approach focuses on patterns of change as a function the current state of a system and the dynamical variables that control the system (i.e., order parameters). The current state of the system is defined by the current values of the dynamical variables. Thus, the dynamical variables define the system as well as changes within it. Often the system is seen as a point in a multi-dimensional space (the phase space). The "control parameters" are the functions that define the relationships among the dynamical variables (see Guestello, 1996, or Vallacher & Nowak, 1994 for a more complete discussion of the dynamical systems approach). Such models can capture the complexity of systems (like groups) and can help to explain seemingly inconsistent or erratic aspects of the systems behavior. Chaos, catastrophe, and complexity theory are all derivatives of this approach.

In the small group arena, probably the most well developed models of this type are Arrow, McGrath, and Berdahl's (2000) complex systems theory of small groups and Nowak, Szamrej, and Latané (1990) dynamic social impact theory. Arrow et al. outline a general theory of small group formation, coordination, development, and adaptation using a complex dynamical systems

approach. They define three levels of dynamical variables: constituent elements of the group or local dynamics (e.g., members, tasks, norms), characteristics of the group as an entity or global dynamics (e.g., size, structure, goals), and the contexts in which the groups are embedded or contextual dynamics (e.g., culture, organization, community). Although group decision-making per se is not a major focus of their work, decision-making is one aspect of the local dynamics of many groups. The theory is very recent and has yet to receive much research attention (though see Berdahl, 1998; 1999), but could hold much promise as a context for future theoretical and empirical developments.

Dynamic social impact theory (Nowak et al., 1990, Latané & Bourgeois, 2001) is an extension of Latané's (1981) theory of social impact that posited three key aspects of social influence associated with the influence source – strength (e.g., power, persuasiveness), immediacy (physical and/or social distance) and number of influence sources compared to the number of targets. The dynamic version of the theory (Nowak, Szamrej, & Latané, 1990; Latané & Bourgeois, 2001) uses a dynamical systems approach to incorporate the dynamic and reciprocal nature of social influence. In addition to the assumptions specified above, the dynamic version of the model adds three more. First, it assumes that individuals (varying in strength and other attributes) are distributed in a social space. Their location in the space defines their immediacy in terms of other individuals within the space. That is, immediacy reflects the degree group members share the same social space**.** Second, each individual is influenced by his/her own position (e.g., belief, attitude, preference) and by the other people in proportion to a multiplicative function of their strength, immediacy, and number. Third, a person will change his/her position if and only if the total persuasive impact (the pressure to change to a different position) outweighs the pressure to maintain one's own position (the strength of the initial

position plus any supportive impact). Dynamic social impact is then taken to be the cumulative effect of the iterative, recursive influence present during interaction

Using computer simulations (SITSIM, Nowak & Latané, 1994), Latané and colleagues have discovered a number of consistent findings, which have then been tested in different experimental settings. The most central finding for current concerns is that people tend to cluster in the social space in terms of position similarity. In other words, a random distribution of positions within the space will soon become organized into "belief clusters". Thus, social sharedness develops naturally as a function of basic dynamic social processes. Second, the space will tend to consolidate in such a way that majority positions tend to become stronger (more prevalent) and minority positions weaker. However, unless the initial majority is extremely large, minority clusters remain even after thousands of iterations. Thus, diversity of opinion continues despite the consolidation process. An additional aspect of the simulations shows that people in clusters tend to become similar to each other on multiple issues – what Latané has called correlation. Thus, sharedness on one dimension induces sharedness on other dimensions. Each of these simulation results have received empirical support in a number of different social aggregates, even in situations where there are few if any reasons for people to change their positions to match those around them (Latané & L'Herrou, 1996). Again, although not yet directly applied to group decision-making, this seems like a rich framework for exploring both the formation and implications of social sharedness in decision-making groups.

Shared Social Identity and Group Decision Making

Although originally a theory of intergroup relations, social identity theory (Abrams & Hogg, 1990; Hogg, 2001; Tajfel & Turner, 1979) has begun to play a major role in understanding small group processes. Based mainly on Turner's (1985) related notions of self

categorization and group prototypes, a number of researchers have shown that making group identity salient impacts on the social influence processes associated with group consensus (e.g., Hogg, Turner, & Davidson, 1990). These theories are reviewed thoroughly in another part of this volume (Hogg & Abrams, Chapter 19), so we will only provide a brief discussion here. The basic ideas stem from the notion that people categorize themselves on many levels, with most levels defined by group membership. When membership in a particular group is made salient, the self becomes defined, in part, by the group. Thus, group norms become more important. Self categorization theory goes on to argue that members hold a prototype of the typical group member and attempt to behave in accordance with (or more like) this prototype. In addition, group identity allows one to differentiate one's self and one's group from other groups, much like any form of categorization both defines what an item is and what it is not. This tends to lead to prototypes that help the differentiation process.

For example, if one categorizes oneself as a member of the group of people who oppose capital punishment, differentiating oneself from people who favor capital punishment would make one more prototypic of one's group. This notion has been used to help explain group polarization and increased conformity to group norms (Abrams, Marques, Bowen, & Henderson, 2000; Hogg et al., 1990). In a sense, the notion of social sharedness is inherent in the idea of social identity. By categorizing one's self as a member of a group, one implicitly recognizes a sharing of whatever characteristics define group membership. Thus, there should be a number of implications of shared social identities for group decision making besides group polarization.

One interesting aspect of shared social identities that has yet to be explored involves whether they can function as shared task representations (Tindale et al., 1996). Shared identities should lead to shared preferences, but if they don’t, arguments or positions consistent with the

shared identity should be particularly influential. There is some evidence that arguments consistent with shared group memberships (religion) can be persuasive even when presented by a minority (Smith et al., 2000). However, much more work in this area is needed to fully understand the role that social identity plays in decision-making groups.

Probably the major theme underlying the future directions discussed here is that decision-making groups are context situated and context sensitive (Hinsz, et al., 1997; Levine, Resnick & Higgins, 1993). Group decisions are made within evolutionary/adaptive, cultural, institutional, intergroup, and historical/normative intragroup contexts developed over the history of the group's existence. The research reviewed here does not pay enough attention to these contextual aspects of group decision-making. However, shared contexts probably play as important a role in decision making groups as do shared preferences, cognitions, and metacognitions. In fact, sharedness at the levels discussed here probably stem from these contextual features. We hope that recent developments in theoretical frameworks that explicitly mention such contextual features will correct this deficiency in the future.

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Table 1

Social Decision Scheme Matrices for Two Models: Proportionality and Majority - Equiprobability Otherwise

Pre-Discussion Preference Pattern		Proportionality[a]		Majority-Equiprobability Otherwise[b]	
G	NG	G	NG	G	NG
6	0	1.00	0.00	1.00	0.00
5	1	0.83	0.17	1.00	0.00
4	2	0.67	0.33	1.00	0.00
3	3	0.50	0.50	0.50	0.50
2	4	0.33	0.67	0.00	1.00
1	5	0.17	0.83	0.00	1.00
0	6	0.00	1.00	0.00	1.00

[a] Combinatorial process that the probability that a group will choose a particular alternative is equal to the proportion of members favoring the alternative at the outset of group interaction.

[b] Combinatorial process that an alternative endorsed by a majority of members at the outset of interaction will be chosen by the group (in cases where no initial majority exists, then each alternative is equally likely to be the group's choice).

Table 2

An Illustrative Example of Group Decision-Making Involving Several Conditional Judgments

Member	Condition 1	Condition 2	Preference
A	Yes	Yes	Invest
B	Yes	No	Not invest
C	No	Yes	Not invest

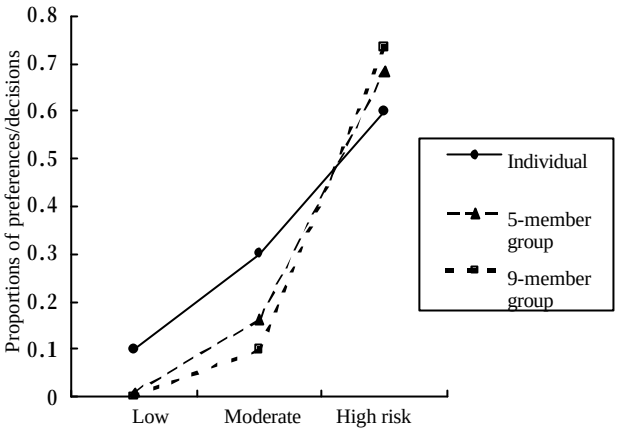

Figure 1. Majority/Plurality Processes and Group Polarization