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How do decision heuristic performance and social value orientation matter in the building of preferences?

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Selart, M., Boe, O., & Takemura, K. How do decision heuristic performance and social value orientation matter in the building of preferences? *Göteborg Psychological Reports, 2000, 30*, No. 6. In the present study it was shown that both decision heuristics and social value orientation play important roles in the building of preferences. This was revealed in decision tasks in which participants were deciding about candidates for a job position. An eye-tracking equipment was applied in order to register participants´ information acquisition. It was revealed that participants performing well on a series of heuristics tasks (availability, representativeness, anchoríng & adjustment, and attribution) including a confidence judgment also behaved more accurately than low performers in the fulfillment of the preference tasks. It was also established that the high performers were not as influenced by whether uncertainty was presented in terms of probabilities or in terms of frequencies as was the low performers. With regard to social value orientation the results revealed that decision processing differences were more systematic between cooperators and competitors than between cooperators and individualists. Also, the cooperators did not seem to attend more to pro-environmental goals than to profit goals in the evaluation of the candidates. Finally, it was shown that accountable cooperators invested more time in their decisions than those that were not accountable, and that no such difference was observed between accountable and not accountable competitors or individualists.

Key words: Decision making, decision heuristics, preferences, social value orientation

One of the most characteristic features of any real world decision is that it relies on both environmental and individual difference factors. With regard to the environmental influence, it has commonly been assumed that the use of different heuristics is an adaptive response of an information processor. This processor has been characterized as a limited capacity to the demands of the decision problem (Payne, Bettman, & Johnson, 1993; Selart & Eek, 1999; Takemura, 1994). Such demands may include how complex the problem is and if uncertainty is involved.

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The results presented by Payne et al. (1993) also suggest that accuracy and effort play a major part for the information process which takes place in the decision situation. According to Payne et al. most human decision strategies must be

considered to be intelligent responses to goals such as these. As a consequence, it has been suggested that researchers may be able to predict how people will decide in a certain situation taking into account the cost and benefit consideration they make (Payne et al. 1993). Similar ideas have been put forward by Simon (1991), the founder of "bounded rationality". According to him, perspectives on human judgment and decision making should rely on our knowledge about the mind´s capacities. In real life, optimal strategies are often unknown or unknowable (Simon, 1987). Simon also emphasizes the importance of the environment. For instance, in his opinion, it can tell whether or not a heuristic is performing well, or in other words, if it is adapted to the environment (Simon, 1956).

The heuristics and biases program: Its nature and some critical remarks

The use of different decision heuristics has also been studied from the perspective that although realizing that they are often fruitful, sometimes they may lead to characteristic errors or biases (Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974). This position implies that despite human decision strategies may generally be considered as intelligent responses to inherent goals, the focus of the researcher must be on the judgmental or perceptual biases. One reasons put forward in favor of this position is that judgmental biases may illuminate the psychological processes that underlie perception and judgment. A second reason is that they have a potential of being useful to problem solving in practical situations (to clinical judgment or intuitive forecasting) (Kahneman & Tversky, 1996). However, this tendency to focus on errors and on the role of judgmental biases in debates on rationality has by some researchers been criticised as being too negative in its remarks on the human mind (Cohen, 1981; Einhorn & Hogarth, 1981; Gigerenzer, 1991, 1993, 1994; Lopes, 1991). For instance, it has been claimed by Gigerenzer that applying probability as any form of rational norm in decision and judgmental research may be considered as controversial. The reason for this is that although probability may be looked upon as a subjective measure or belief, the concept of "probability" may also be interpreted as a series of long-run relative frequencies. This latter position implies, among other things, a refusal of assigning probabilities to unique events. As an empirical illustration of this theoretical claim, Gigerenzer has in several studies revealed how well-established judgmental errors may disappear if questions are asked in terms of frequencies rather than in terms of probabilities. In addition, he has shown that such disappearances may occur if a procedure of random sample is strictly applied (Gigerenzer & Murray, 1987).

The importance of individual difference for human decision behavior

It is a well-known fact that individual difference also plays an important role in human decision behavior (Payne et al., 1993). For instance, people with different identities may respond quite differently to the same situation. This may depend on that they have different prior knowledge, but may as well has its roots in differences with regard to cognitive abilities (Selart & Eek, 1999). Individual

differences may occur in such different capacities as perceptual ability, risk-taking propensity, or aspiration level which are all of relevance for our decision behavior. Within the field of social decision making, special attention has been paid to individual difference with regard to social value orientation (Kuhlman & Marshello, 1975; Liebrand & McClintock, 1988; Messick & McClintock, 1968; McClintock, 1978). Results in this area imply that the cooperative behavior of humans is depending on individual differences in how people evaluate outcomes for themselves and others. For instance, it has been revealed that people may be categorized into three distinct orientations if asked to make a choice between options differing on own and others´ outcome in a socially interdependent situation (Messick & McClintock, 1968). Those are the cooperative orientation (maximize joint gains), the individualistic orientation (maximize own gain), and the competitive orientation (maximize the difference between own gain and other gain). Empirical research reveal that social value orientation together with the problem structure of the decision environment and expectations about another person´s choice behavior has a good potential of informing us about social choice behavior (McClintock & Liebrand, 1988; Selart & Eek, 2000).

Hypotheses

In the present study, participants were initially presented with a couple of tasks measuring biases connected to the representativeness, availability, and anchoring & adjustment heuristic (Tversky & Kahneman, 1974). In addition, the tasks were also designed to measure biases related to the use of the attribution heuristic (Plous, 1993). Each task was designed so that participants first were instructed to chose one out of two options, knowing that one of the answers was correct and the other one incorrect. Subsequently, they were instructed to make a confidence judgment on a half-range scale, indicating how sure they were having chosen the correct answer (see for instance Fischhoff, Slovic, & Lichtenstein, 1977; Lichtenstein & Slovic, 1977; Oskamp, 1965). The main reason for adding the dimension of confidence to the fulfillment of the heuristic tasks was that it would add critical information about participants´ ability to perform accurate judgments.

Based on the outcome of this test, it was possible to subdivide the participants according to their performance. High performers were characterized by a low degree of biases with regard to the achievement on the heuristic tasks (availability, representativeness, anchoring & adjustment, attribution). Another feature was that they were also quite well calibrated. Low performers were on the other hand producing a high degree of biases on the heuristic test, and were also characterized by being not so well calibrated.

Participants also completed a social value orientation test in which their individual predisposition to act in a more or less cooperative manner was measured. (Kuhlman & Marshello, 1975; Van Lange & Kuhlman, 1994). The test was designed as a decomposed game. Depending on the outcome of the test, participants were either classified as individualists, cooperators or competitors.

After having completed these two initial paper and pencil blocks of tasks, participants were asked to conclude a number of computerized multi-attribute preference tasks. A paper and pencil condition was also conducted for control purpose. All the tasks involved deciding about candidates for a job position, and

the participants were asked to take the role of a consulting adviser for a company involved in personnel recruitment. In these tasks, uncertainty was either expressed in terms of probabilities or in terms of frequencies. Furthermore, participants were either made accountable for their decisions or not (Selart, 1996; Takemura, 1993, 1994). During the fulfillment of the tasks, both participants´ decision processes and their preferential outcomes were registered. A main question of interest was to determine whether participants performing well on the heuristics tasks also would behave more accurate than low performers in the fulfillment of the preference tasks. Hence, high performers were thus expected to use more optimal decision strategies, compensatory in nature, that is, characterized by a refusal to make trade-offs **(Hypothesis 1)**. This is an assumption which builds on the results presented by Payne et al. (1993). Accordingly, in the present study it is hypothesized that the high performers on the heuristics tasks will use more accurate decision strategies in their decision processing than the low performers (se also Payne et al., 1993).

Another assumption is that the high performers on the heuristics tasks also will be less influenced by the mode in which uncertainty is presented, than the low performers. In line, it is hypothesized that whether uncertainty is expressed in terms of probabilities or in terms of frequencies will not be as crucial for the high performers as for the low performers **(Hypothesis 2)** It is believed that so will be the case both with regard to the decision process and its outcome.

In complement to our first hypothesis, it may also be assumed that participants´ ability to reason in a cooperative manner could have an influence on their use of accurate decision strategies concerning the preference tasks. To be able to test this idea, we created two classes of attributes describing the alternatives in the preference tasks. Both classes (profit attributes and pro-environmental attributes) were assumed to attract the attention of the cooperators, whereas it was assumed that one class (the profit attributes) predominantly would be able to attract the attention of the individualists and the competitors. It was hence assumed that the cooperators would not to the same extent involve themselves in trade-offs between the two classes of attributes as would the pro-selves and the competitors. As a consequence, it was hypothesized that the cooperators would use more compensatory decision strategies than the other two groups of participants **(Hypothesis 3)**.

Furthermore, it is also assumed that cooperators will be more sensitive to accountability in decision situations than individualists and competitors. This idea is based on the notion conveyed by Lerner and Tetlock (1999) that although thinking is to be regarded as an inner conversation, it must also be regarded as a part of a social interaction in which one is addressing other persons as well as oneself (see also Mead, 1934). It is thus hypothesized that cooperators - which are held accountable for their decisions - to a higher extent will be affected in their decision behavior than ditto individualists and competitors **(Hypothesis 4)**.

Method

Participants

'One hundred and ninety-two undergraduates (96 men and 96 women) at Göteborg University participated in the experiment in return for the equivalent of $7. These participants had on prior occasions indicated that they were willing to take part in the experiment. Participants were randomly assigned to four groups. The mean age of the participants was 24.4 years (Sd= 3.6) which fell in range in between 18 to 39 years.

Materials

All participants were first requested to complete two paper and pencil tests booklets. The first test was a diagnostic test measuring the degree of biases in different decision heuristics. The second test measured the participants social value orientation (e.g. Kuhlman & Marshello, 1975; Van Lange & Kuhlman, 1994). The participants were then administered either a computerized version of a job recruitment task or a paper and pencil version of the same task. An eye tracking equipment, the Eyegaze System (cf. Boe, Selart & Takemura, 2000, Lohse & Johnson, 1996), was used together with the computerized version of the job recruitment task.

Design

The design was mixed factorial with frequency-based vs. probability-based information as one of the between subjects factor. Another between-subjects factor was whether participants were assigned to an accountability or a non-accountability condition. A third between-subjects factor that was applied was whether participants were requested to accept or reject job candidates in the presented tasks. A within-subject factor was whether participants were presented with single or multiple event scenarios.

Procedure

Participants attended the experiment one at the time in the laboratory. They were seated in a private boot in front of a computer screen, after having arrived at the laboratory. They were requested to first fill out the test that measured the degree of biases in different decision heuristics. The test booklet consisted of 24 questions. These questions were adopted from earlier research on heuristics and biases (Kahneman & Tversky, 1973; Tversky & Kahneman, 1973, 1974, 1982). The 24 questions were divided into four decision heuristic categories dependent upon which decision heuristic they measured. Each of the four decision heuristic categories consisted of six questions. The four decision heuristic categories included in the booklet were representativeness, availability, attribution, or anchoring and adjustment. Each question always had a correct answer and a wrong answer. After having given an answer, participants were also requested to give a confidence rating on a scale ranging from 50 (making a guess) to 100 (absolutely sure) how sure they were that they had given the correct answer. Subsequently participants were requested to fill out the test that measured their social value orientation. This test consisted of nine different tasks and participants were in each task requested to divide points between themselves and a stranger to them. Three different alternatives existed in each task. Dependent upon how participants chose to divide the points, three types of social value orientations were distinguished. Participants were coded either as cooperators, competitors, or as individualists. After having completed the two tests, participants were randomly assigned to either an eye-gaze condition or a paper and pencil version of the same task. For the participants in the eye-gaze condition, a calibration procedure was thoroughly performed so that the Eyegaze System could be used in the experiment. This calibration procedure usually took about two minutes for each new participant.

The participants were then given general instructions about how to perform the experiment. They were at the same time also instructed that their task in the experiment was to act as a job recruiter and that they had a variety of different organizations in the trade and industry as their clients. Participants were also told that their task was to make decisions about job candidates (in some cases groups of candidates). In this respect, it was made clear that their decisions were to be based on as thorough judgments as possible. Participants were also told that the different candidates or groups of candidates would differ to what degree they could fulfil a certain company´s goal. The eight candidates or groups of candidates ability to obtain these goals were for half of the participants expressed on a probability scale ranging from 1-100%. The other half of the participants were instead presented with information about the candidates in terms of how frequent it was that the candidates would achieve the goals, for instance in 3 cases out of 10. All participants were given a total of eight different problems. Four of the problems represented single events presenting information about eight single candidates, whereas the remaining four problems consisted of multiple events. In the latter case, the information presented entailed groups of candidates instead of single candidates. Furthermore, in both the single events and the multiple events scenarios four candidates or groups of candidates were enriched and the remaining four impoverished. The enriched options had more both more positive and negative dimensions than the impoverished options. Shafir (1993) has reported that the positive dimensions of an option received

more weight in selecting than in rejecting, and that the negative dimensions of an option received more weight in rejecting than in selecting. The result of this was that the enriched option tended to be both chosen and rejected relatively more often then the impoverished option. For half of the participants, the task in each situation was to select the best four candidates or groups of candidates for a post in an organization. The participants were also informed that the four candidates that they selected would continue to further interviews or analyses. The other half of the participants were similarly informed that their task instead was to sort out and reject the four least suitable candidates or groups of candidates for a post in the organization. They were furthermore told that the four candidates or groups of candidates that they rejected would not continue to further analyses or interviews. In table 1, an overview of the different experimental conditions can be viewed.

Table 1. The different conditions used in the experiment

		Accountability			No Accountability
Condition	Task	Information	Condition	Task	Information
SFA	Select	Frequency-based	SFNA	Select	Frequency-based
SPA	Select	Probability-based	SPNA	Select	Probability-based
RFA	Reject	Frequency-based	RFNA	Reject	Frequency-based
RPA	Reject	Probability-based	RPNA	Reject	Probability-based

Each scenario contained information about job candidates expressed with eight different attributes. Four of these attributes concerned profit goals (e.g improving the company´s production, share of the market and profit, and increasing sales) (Cyert & March, 1963). The remaining four attributes were related to environmental goals (e.g decreasing the company´s effluent-level, improving the company´s working environment, environmental policy, and energy-saving). An example of one of the four multiple event scenarios given to non-accountability participants in the select conditions with probability-based information can be found in Figure 1.

Half of the participants in the select and reject conditions were instructed that they were not requested to justify their decisions to others because of their role as outside consultants. In addition, they were also told that it would be anonymous to the company who made the decision. The other half of the participants were instead told that the company demanded that they as outside consultants would have to justify and give arguments for their decisions in a meeting with the management and the job applicants. They were also required to take personal responsibility for their decisions. This was done with the aim of inducing accountability.

Figure 1.
An example of a Multiple Events Information Scenario given to Non-Accountability Participants in the Select Conditions with Probability-Based Information.

Imagine that you as an outside consultant are going to choose among eight different groups of candidates to an information division in a chemical company. The eight different groups of candidates differ regarding to which degree they can be expected to promote certain aims that the company has. The candidate groups ability to achieve these aims are expressed in terms of how probable it is that they will reach the expected aims on a scale ranging from 1- 100%. We want you to select the four best groups of candidates that will continue to an interview. Ponder that you as an outside consultant do not have to justify your decision to others and that it will be anonymous in the company who made the decision.

Groups of Candidates	Decreased effluent-level	Improved share of the market	Increased sales	Improved working environment	Improved environmental policy	Improved energy-saving	Improved productivity	Improved profit
GroupD	60%	50%	60%	40%	40%	50%	50%	50%
GroupA	20%	20%	30%	80%	30%	80%	80%	90%
GroupE	70%	70%	80%	20%	80%	30%	30%	30%
GroupB	80%	30%	90%	30%	70%	20%	70%	30%
GroupF	80%	70%	20%	70%	30%	20%	90%	20%
GroupC	40%	50%	40%	50%	50%	60%	60%	60%
GroupG	40%	40%	50%	50%	50%	60%	60%	50%
GroupH	50%	40%	60%	40%	50%	60%	50%	60%

Which four candidates do you select?

In the general instruction it was stressed that participants did not have to rank order the chosen alternatives. Moreover, participants were told that it did not matter in which order they were selected. All participants were explicitly instructed to carefully consider all information presented on the screen while making their choices.

After having considered the information they pressed the return button and typed in their choices. Thereafter they pressed the return button again and another scenario was presented. Participants assigned to the paper and pencil version simply wrote down their choices on the bottom of each page before continuing to the next page. All participants were given eight scenarios, four including single candidates and four comprising groups of candidates. The different environmental or profit attributes, as well as the positions of the different candidates or groups of candidates were randomized for each scenario. Each participant also received a randomized presentation of the scenarios. After having participated in the sessions, participants were debriefed and paid. The sessions lasted for approximately 50 minutes.

Results

Measures of the heuristics tasks

The performance measure was constructed by summing the number of times the respondents answered correctly across the 24 different heuristic questions. The correct answers were coded as 1, and the incorrect one as 0. If participants chose the correct answer, the corresponding confidence rating was treated as positive, otherwise it was coded as a negative value. An index measure of confidence was obtained by taking the mean values of the confidence ratings of the same 24 questions. All participants that were performing above the mean value on the choices (Mv=11,20, Sd=2.60) and on the confidence ratings (Mv=-4.53, Sd=17.47) were coded as high achievers, and those performing below or equal to the mean values were coded as low achievers. In this way, it was possible to create two groups of participants, one consisting of high achievers with high accuracy and calibration, and another group of low achievers with low accuracy and calibration.

Recoding of the eye fixations data

In order to investigate whether high achievers used more compensatory decision strategies than low achievers, analyses of the eyegaze recordings were made. Depth of search refers to the total amount of information that is searched (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Klayman, 1983; Payne, 1976; Svenson, 1979). In the present experiment, only depth of search was used to examine whether participants used compensatory or noncompensatory decision strategies, due to limitations in the Eye Gaze recorder´s processing software. Another strategy measure that was used in the present study was participants response latency time (in milliseconds).

A mean value of latency time for each attribute in milliseconds was constructed. Each attribute was measured eight times since there was a total of eight problems for which each of the attributes could be attended to in each problem. A second mean value of the four profit attributes and a third mean value of the four environmental attributes were likewise constructed (both in milliseconds).

The time required to acquire information using eye fixations varies between 200 ms to 400 ms (Russo, 1978; Card, Moran, & Newell, 1983) An index was therefore constructed based upon the mean value (300 ms) of these two endpoints. All participant´s attention that required less than 300 ms upon an attribute was coded as 0, and 1 whereas if it required more than 300 ms it was coded as 1. Summing the four profit attributes (now recoded as 1 or 0) that participants had been attending to, a measure indicating the number of attributes that had received attention was created. It ranged from 0 to 4. The same procedure was used to construct another measure for the four environmental attributes (also recoded as 1 or 0). In this way, it was possible to investigate to what degree participants focused upon profit or environmental attributes.

Analyses of participant´s performance on the decision heuristic test and their social value orientation in relation to the number of and time spent on the attributes

A chi-square test performed on the high achievers on the decision heuristic test indicated that which social value orientation participants had, made no significant differences, c^2_2 =2.71, n.s. Similarily, another chi-square test performed on the low achievers yielded the same non-significant result, c^2_2 =3.06, n.s. Both tests indicated that there was no relationship between the participant´s performance on the decision heuristic test and their type of social value orientation.

Hypothesis 1: High performers are expected to use more optimal decision strategies than low performers

Analyses of the eye-fixation data

High achievers were expected to use more compensatory decision strategies when processing information than low achievers were expected to. Table 2 reveals the mean percentages of the time participants attended to the attributes (in milliseconds) as well as the number of attributes attended to by high and low achievers. As is clearly indicated, high achievers searched for information during a longer time than low achievers did, both concerning profit and environmental attribute information. As may also be seen, high achievers searched for the information by using more attributes than did low achievers. A 2 (group: high-achievers vs. low-achievers) by 3 (social value orientation: competitors vs. individualists. vs. cooperators) by 2 (attributes: profit vs. environmental attributes) mixed ANOVA with repeated measures on the last factor performed on the number of attributes yielded a significant main effect of attributes, $F(1, 55)$= 4.97, $p<.05$, MS_e=3.70. This effect revealed that participants searched for more information concerning profit goals than environmental goals. A main effect of group was also found, $F(1, 55)$= 5.30, $p<.05$, MS_e=5.30. In line with the expectations this effect showed that high achievers attended to more attributes than did low achievers. Separate Bonferonni-corrected t-tests at p=.05 revealed that this difference was reliable for the environmental attributes, $t(66)$ = 2.67, $p<.05$, but not for the profit attributes. Furthermore, an effect of social value orientation was found, $F(1, 55)$= 7.16, $p<.05$, MS_e=17.28, revealing that participants with a cooperative social value orientation attended to significantly more attributes than participants with a competitive or individualistic social value orientation. No significant differences were found between participants with an individualistic or competitive social value orientation. Another 2 (group: high-achievers vs. low-achievers) by 3 (social value orientation: competitors vs. individualists. vs. cooperators) by 2 (attributes: profit vs. environmental attributes) mixed ANOVA with repeated measures on the last factor performed on the time spent on searching the attributes resulted in a significant main effect of attributes, $F(1, 55)$= 5.52, $p<.05$, MS_e=9.03. Again it was revealed that participants attended more to profit attributes than to environmental attributes.

However, the main effect of group did not reach significance, $F(1, 55)= 3.30$, $p=.074$, $MS_e=10.03$. Separate Bonferonni-corrected t-tests at $p=.05$ showed that participants searched the profit attribute information significantly more often than they searched the environmental attribute information, $t(77) = 3.03$, $p<.01$. Furthermore, high achievers were found to reveal a quite strong tendency to attend more to the environmental attributes as compared to low achievers, $t(66) = 2.67$, $p=.069$. No significant differences were found for the time attended to the profit attributes. Finally, an effect of social value orientation was again found, $F(1, 55)= 7.16$, $p<.05$, $MS_e=17.28$, further substantiating the finding that participants with a cooperative social value orientation attended to significantly more number of attributes as compared to participants with a competitive or individualistic social value orientation. There existed no significant differences between participants with an individualistic or competitive social value orientation. Table 3 reveals the number of attributes that competitors, individualists, and cooperators attended to, as well as the time they spent on the attributes.

Table 2.
Mean Values for Time Spent on the Attributes in Milliseconds and Number of Attributes (scale 0-4) Attended to by High and Low Achievers

	Time spent on the attributes		Number of attributes	
	Profit Goals	Environmental Goals	Profit Goals	Environmental Goals
High achievers	1615.4	774.1	1.44	1.15
Low achievers	721.1	406.2	0.83	0.34

Table 3.
Mean Values for Time Spent on the Attributes in Milliseconds and Number of Attributes (scale 0-4) Attended to by High and Low Achievers

	Time spent on the attributes		Number of attributes	
	Profit Goals	Environmental Goals	Profit Goals	Environmental Goals
High achievers				
Competitors	1166.8	473.3	1.00	0.45
Individualists	714.5	491.0	1.00	1.00
Cooperators	2965.0	1358.0	2.33	2.00
Low achievers				
Competitors	432.6	195.2	0.40	0.01
Individualists	307.4	480.0	0.50	0.25
Cooperators	1423.3	543.3	1.58	0.75

Hypothesis 2: The presentation mode of uncertainty will not be as crucial for the high performers as for the low performers

Analyses of the eye fixation data

High achievers were expected to be less affected than low achievers by whether the information was probability- or frequency-based. A 2 (group: high-achievers vs. low-achievers) by 2 (condition: probability-based vs. frequency-based information) by 2 (attributes: profit vs. environmental attributes) mixed ANOVA with repeated measures on the last factor performed on the number of attributes yielded a significant main effect of attributes, $F(1, 64)= 8.63$, $p<.01$, MS_e=6.55. This effect again confirmed that participants searched for more information concerning profit goals than concerning environmental goals. A main effect of group was also found, $F(1, 64)= 5.04$, $p<.05$, MS_e=15.26, revealing that high achievers attended to the attributes reliably more than low achievers. In accordance with hypothesis 2, separate Bonferonni-corrected t-tests at p=.05 performed on the high achievers revealed that no significant differences existed between the probability- or frequency-based information conditions regarding the time spent on searching for information concerning the two types of attributes or concerning the number of attendance paid to these. There was not revealed any significant differences between high achievers in the probability- or frequency-based conditions for any of the single profit or environmental attributes. In line, low achievers showed no significant differences for the time spent on the profit or on the environmental attributes. However, whether low achievers had been searching for information about an attribute or not were found to have some effects on the time used. Additional separate Bonferonni-corrected t-tests at p=.05 revealed that low achievers search for information concerning some of the attributes (the profit attribute of improved share of the market, and the

environmental attributes of improved energy-saving, decreased effluent-level, and improved working environment) were reliably different between these achievers in the frequency- and probability-based information conditions. Table 4 shows the mean percentages of low achiever´s searches for information for the above mentioned attributes. The other environmental and profit attributes, as well as the number of environmental or profit attributes that were searched for revealed no significant differences between the two conditions.

Table 4.
Mean Percentages (scale ranging from 0 to 1) of High and Low Achievers Searches of Attributes and *t*-test Effects for Participants in the Frequency-and Probability-Based Information Conditions

Attributes	Probability-based information	Frequency-based information	Effects
Low achievers			
Improved productivity	.25	.01	$t(24) = 1.25$, $p=.22$
Increased sales	.42	.50	$t(24) = -.41$, $p=.69$
Improved share of the market	.25	.00	$t(24) = 2.08$, $p<.05$
Improved profit	.25	.21	$t(24) = .21$, $p=.84$
Improved environmental policy	.00	.01	$t(24) = -.92$, $p=.37$
Improved energy-saving	.25	.00	$t(24) = 2.08$, $p<.05$
Decreased effluent-level	.25	.00	$t(24) = 2.08$, $p<.05$
Improved working environment	.00	.29	$t(24) =-2.10$, $p<.05$
High achievers			
Improved productivity	.48	.33	$t(40) = .93$, $p= .36$
Increased sales	.38	.38	$t(40) = .00$, $p=1.00$
Improved share of the market	.43	.33	$t(40) = .62$, $p= .54$
Improved profit	.33	.48	$t(40) = -.93$, $p= .36$
Improved environmental policy	.19	.14	$t(40) = .41$, $p= .69$
Improved energy-saving	.48	.33	$t(40) = .93$, $p= .36$
Decreased effluent-level	.48	.33	$t(40) = .93$, $p= .36$
Improved working environment	.24	.24	$t(40) = .00$, $p=1.00$

Analyses of the preference data

Again lending support to hypothesis 2, separate Bonferonni-corrected *t*-tests at *p*=.05 performed on the high achievers confirmed that the only significant difference between the frequency- and probability-based information groups was related to their choices of one of the enriched candidates (candidate A). Choices of candidate A reached 57.6% in the frequency-based information group, and 70.1% in the probability-based information group. High achieving participant´s choices

of the enriched or impoverished candidates did not reveal any significant differences. As can be seen in table 5, low achievers differed significantly between the frequency- and probability-based information groups for several of the attributes, as well as for the overall choices of the enriched candidates. These results are also in line with hypothesis 2.

Table 5.
Mean Percentages (scale 0-100) and t-test Effects of High and Low Achieving Participants Choices of the Enriched or Impoverished Candidates

| Choices of candidates | Condition | | Effects |
	Probability-based information	Frequency-based information	
Low achievers			
Enriched	60.2	49.9	$t(90) = 2.56, p<.05$
Impoverished	39.8	50.1	$t(90)= -2.50, p<.05$
High achievers			
Enriched	58.4	53.2	$t(90) = 1.15, p=.25$
Impoverished	41.6	46.8	$t(90) =-1.12, p=.27$

Low achievers choices of the other remaining candidates did not reveal any significant differences between the frequency-and the probability-based information groups.

Hypothesis 3: Cooperators are supposed to use more optimal decision strategies than individualists and competitors

Analyses of the eye fixation data

It was furthermore expected that participants with a cooperative value orientation would to a higher degree process the information more compensatory than participants with an individualistic or competitive value orientation. Separate Bonferonni-corrected *t*-tests at *p*=.05 showed significant differences between individualists and cooperators for the profit attributes of improved productivity, increased sales, improved share of the market, and for the total time spent on profit attributes. The other attributes showed no significant differences. Table 6 reveals the time (in milliseconds) that individualists and cooperators used in searching information for these attributes.

Table 6.
Time (in milliseconds) that Individualists and Cooperators Used for Searching Information

	Individualists	Cooperators	Effects

All four profit attributes	626.9	2139.0	$t(42)= -2.22, p<.05$
Improved productivity	495.3	1784.3	$t(42)= -2.12, p<.05$
Increased sales	696.1	3863.9	$t(42)= -2.40, p<.05$
Improved share of the market	441.4	1382.0	$t(42)= -2.05, p<.05$
Improved profit	874.7	1526.0	$t(42)= -1.25, p=.22$
All four environmental attributes	620.1	913.6	$t(42)= -1.06, p=.30$
Improved environmental policy	526.4	471.3	$t(42)= .17, p=.86$
Improved energy-saving	691.4	1891.7	$t(42)= -1.92, p=.06$
Decreased effluent-level	454.7	745.5	$t(42)= -1.12, p=.27$
Improved working environment	808.0	545.8	$t(42)= .56, p=.58$

As can be clearly observed in Table 7, differences between individualists and cooperators were found for the attribute increased sales, as well as for the total number of profit attributes that participants searched for. For the remaining attributes no significant differences were observed.

Table 7.
Number of Attributes that Individualists and Cooperators Searched for or Attended to

	Individualists	Cooperators	Effects
All four profit attributes*	.89	1.92	$t(42)= -2.39, p<.05$
Improved productivity	.21	.48	$t(42)= -1.87, p=.07$
Increased sales	.16	.52	$t(42)= -2.60, p<.05$
Improved share of the market	.21	.44	$t(42)= -1.60, p=.12$
Improved profit	.32	.48	$t(42)= -1.09, p=.28$
All four environmental attributes*	.95	1.32	$t(42)= -.86, p=.39$
Improved environmental policy	.21	.16	$t(42)= .42, p=.68$
Improved energy-saving	.21	.44	$t(42)= -1.60, p=.12$
Decreased effluent-level	.21	.48	$t(42)= -1.87, p=.07$
Improved working environment	.32	.24	$t(42)= .55, p=.59$

*Scale ranging from 0 to 4. For single attributes the scale was from 0 to 1.

A 3 (group: competitor vs. individualist vs. cooperator) by 2 (type of attributes: profit vs. environmental) mixed ANOVA with repeated measures on the last factor performed on the time attended to by participants yielded a significant main effect of type of attribute, $F(1, 66)= 7.79, p<.01, MS_e=11.49$. This effect revealed that participants searched for more information concerning profit goals than concerning environmental goals. Furthermore, a main effect of group was also found, $F(2, 66)= 4.66, p<.05, MS_e=13.82$, revealing that participants with a cooperative value orientation attended more to the attributes than participants with a competitive or individualistic value orientation. As can be seen in Table 8, differences were also found between cooperators and competitors for several attributes regarding the time (in milliseconds) that they attended to the attributes. Separate Bonferonni-corrected *t*-tests at $p=.05$ revealed that cooperators attended to the profit attributes of increased productivity, improved share of the market, and increased profit significantly longer than competitors

did. Furthermore, the environmental attributes of improved energy-saving and decreased effluent-level also received reliably more attention from cooperators than from competitors. Finally, cooperators were also found to attend significantly longer to both the profit and environmental attributes than competitors. Separate Bonferonni-corrected t-tests at $p=.05$ on the remaining attributes resulted in no significant differences.

Table 8.
Cooperators and Competitors Time (in milliseconds) Used in Searching for Information

	Cooperators	Competitors	Effects
All four profit attributes	2139.1	832.1	$t(48)= 2.09, p<.05$
Improved productivity	1784.3	431.0	$t(48)= 2.50, p<.05$
Increased sales	3863.9	2105.5	$t(48)= 1.37, p=.18$
Improved share of the market	1382.0	314.6	$t(48)= 2.64, p<.05$
Improved profit	1526.1	477.3	$t(48)= 2.43, p<.05$
All four environmental attributes	913.6	318.4	$t(48)= 2.81, p<.01$
Improved environmental policy	471.3	72.9	$t(48)= 1.95, p=.06$
Improved energy-saving	1891.7	396.9	$t(48)= 2.79, p<.01$
Decreased effluent-level	745.5	150.6	$t(48)= 3.28, p<.01$
Improved working environment	545.8	653.0	$t(48)= -.26, p=.80$

An additional 3 (group: competitor vs. individualist vs. cooperator) by 2 (number of attributes: profit vs. environmental) mixed ANOVA with repeated measures on the last factor performed on the number of attributes searched yielded a significant main effect of type of attributes, $F(1, 66)= 5.10, p<.05$, $MS_e=3.68$. This effect revealed that participants searched more information concerning profit goals than environmental goals. Again, a main effect of group was revealed, $F(2, 66)= 5.29, p<.01$, $MS_e=13.96$, lending further support to the hypothesis that participants with a cooperative value orientation searched for more attributes than participants with a competitive or individualistic value orientation. Separate Bonferonni-corrected t-tests at $p=.05$ confirmed these differences. A comparison between the cooperators and competitors was made regarding the number of attributes that was attended to. As may be seen in Table 9, cooperators attended significantly more to the profit attributes of increased productivity, improved share of the market and improved profit than competitors. The same pattern emerged for the environmental attributes of improved environmental policy, improved energy-saving and decreased effluent-level, indicating again that cooperators attended more to the attributes as compared to competitors. Moreover, the total number of attributes attended to also resulted in the same differences, even though the difference between competitors and cooperators seemed to be more pronounced for the environmental attributes than for the profit attributes.

Although not expected from the hypothesis, two significant differences were observed when a comparison between competitors and individualists was performed. The improved environmental policy attribute received reliably more attention from individualists than from competitors. The time that competitors

spent in searching for the attribute was 72.9 milliseconds, whereas individualists spent 526.4 milliseconds searching for it. Furthermore, the number of times that competitors had searched for the attribute was lower than the number of times individualists searched for it (.12 and .21, respectively).

Table 9.
Mean Percentages of Attributes and Number of Attributes Searched for by Cooperators and Competitors

	Cooperators	Competitors	Effects
All four profit attributes*	1.92	.80	$t(48)= 2.67, p<.05$
Improved productivity	.48	.12	$t(48)= 2.96, p<.01$
Increased sales	.52	.36	$t(48)= 1.13, p=.26$
Improved share of the market	.44	.12	$t(48)= 2.64, p<.05$
Increased profit	.48	.20	$t(48)= 2.14, p<.05$
All four environmental attributes*	1.32	.36	$t(48)= 3.17, p<.01$
Improved environmental policy	.16	.00	$t(48)= 2.14, p<.05$
Improved energy-saving	.44	.12	$t(48)= 2.64, p<.05$
Decreased effluent-level	.48	.12	$t(48)= 2.96, p<.01$
Improved working environment	.24	.12	$t(48)= 1.10, p=.28$

*Scale ranging from 0-4. For all other attributes a scale ranging from 0-1 was used.

Hypothesis 4: Accountability will have a higher impact on cooperators than on individualists and competitors

Analyses of the response latency data

It was finally hypothesized that participants with a cooperative value orientation would be affected by accountability to a higher degree than participants who revealed an individualistic or competitive value orientation. A mean value of the time used in each scenario before making a decision was constructed. It was revealed that the time in milliseconds that accountable cooperators used before making a decision in the scenarios was higher (Mv=80248.6) than the time used by non-accountable cooperators (Mv=56241.6).

In line with the hypothesis, a separate Bonferonni-corrected *t*-test at *p*=.05 showed that the response latency time was significantly higher for cooperators that were accountable than for cooperators that were not accountable, t(29)= 2.35, *p*<.05. Accountable cooperators were also found to ponder the information for the attribute increased sales reliably more than non-accountable cooperators, t(29)= 2.34, *p*<.05. No significant differences in response latency time was found between accountable and non-accountable individualists or competitors on any of the other attributes.

Analyses of the preference data

Additional separate Bonferonni-corrected *t*-tests at *p*=.05 performed on the choices that participants made, yielded that there existed no significant differences between the accountable and non-accountable individualists regarding their choices. The same result was revealed when investigating whether there existed any differences between the accountable and non-accountable competitors. These results are in line with the hypothesis that participants with an individualistic or competitive value orientation would not be affected by accountability. On the other hand, cooperative participants did not seem to be affected when they were told that they were accountable for their decisions as compared to when they were not told that they were accountable. A reliable difference was encountered between accountable (Mv=35.6) and non-accountable (MV=47.8) cooperators regarding their choices of one of the impoverished candidates (Candidate G), *t*(29)= -2.13, *p*<.05, although the direction of the revealed difference was in contradiction to the hypothesis. No other significant differences between the two groups were revealed.

Discussion

The impact of decision heuristics on the building of preferences

The present study revealed that participants performing well on the heuristics tasks (availability, representativeness, anchoríng & adjustment, attribution; Kahneman & Tversky, 1973; Plous, 1993; Tversky & Kahneman, 1972; 1974; 1982) and on confidence judgment tasks (Fischhoff, Slovic, & Lichtenstein, 1977; Lichtenstein & Slovic, 1977; Oskamp, 1965) also behaved more accurately than the low performers in the fulfillment of the preference tasks. For instance, it was shown that high performers invested more time in searching for information than did low performers. It was also established that high performers investigated more attributes in their search for information in comparison with low performers. An interesting exploitative finding was that high performers also tended to attend more to the pro-environmental attributes than did low performers. All these results suggest that the ability to reason in a logically and statistically correct way, combined with a good self-calibration, clearly has an impact on the extent to which people are using optimal decision strategies in multi-attribute decision situations. The findings hereby add credit to the opinion that accurate decision behavior may be determined based on the usage of decision strategies (the weighted additive strategy being used as a normative yardstick for accurate decision behavior; see Payne et al., 1993).

Furthermore, it was revealed that the high performers were not as influenced by whether uncertainty was presented in terms of probabilities or in terms of frequencies as was the low performers. For instance, the high performers spent a more equal amount of time between the two conditions (probability/frequency) searching for information, compared with the low performers. Also, the high performers were not to the same extent biased by the conditions (probability/frequency) in their preferences for any of the groups of alternatives (enriched or impoverished alternatives), compared with the low

performers. The results hereby extend the findings made by Gigerenzer (1994) which indicate that people in general tend to be less biased when uncertainty is expressed in terms of frequencies compared to when it is expressed in terms of probabilities. More specifically, according to the present results, this seems particularly to be the case with humans that are performing below the average on decision heuristic and confidence judgment tasks.

The impact of social value orientation on the building of preferences

Another important finding of the present study was that also social value orientation. (Kuhlman & Marshello, 1975; Van Lange & Kuhlman, 1994) had an impact on participants´ decision behavior. However, no reliable interactions between performance on the heuristics tasks and social value orientation were detected, indicating that both factors work independently. With regard to the hypothesis that cooperators would use more optimal decision strategies than competitors and individualists, only partial support was however provided. Basically, the results indicated that the differences were more systematic between the cooperators and the competitors in this respect than between the cooperators and the individualists. Also, the cooperators did not seem to attend more to the pro-environmental goals than to the profit goals (Cyert & March, 1963). When comparing the cooperators with the competitors, the results revealed that the former group overall invested more time and effort in its search for information with regard to both classes of attributes. Consequently, these results indicate that cooperators in their need for maximizing a common gain in an organizational setting, are using more optimal decision strategies than competitors.

When comparing the cooperators with the individualists it was found that the former group investigated more time and effort with regard to the profit attributes than the latter. Also, there were less differences observed between the two groups with regard to the investigation of the pro-environmental attributes. The results hereby suggest that in an organizational context, cooperators may find profit goals (which are important for the group) more important to explore than pro-environmental goals (which are important for society). Individualists may on the other hand not make such distinctions.

Finally, it was hypothesized that cooperators to a higher extent than individualists and competitors would be influenced by accountability in their choices of decision strategies. The results revealed that the response latency time was significantly higher for cooperators that were accountable for their decisions than for those that were not accountable. No differences in response latency time was found between accountable and non-accountable individualists or competitors on any of the attributes. However, in line with previous results (Boe, Selart, & Takemura, 2000; Selart, 1996; Simonson & Nye, 1992; see also Lerner & Tetlock, 1999, for a review) it was revealed that accountability had no effect on preference reversals, that is, it had an equal likelihood of altering preferences as a function of elicitation procedures (selection or rejection of alternatives).

Conclusion

In the present study it was shown that both decision heuristics and social value orientation play important roles in the building of preferences. The decision tasks consisted of deciding about candidates for a job position. An eye-tracking equipment was applied in order to register participants´ information acquisition. It was revealed that participants performing well on a series of heuristics tasks (availability, representativeness, anchoríng & adjustment, attribution) including a confidence judgment also behaved more accurately than the low performers in the fulfillment of a series of computerized preference tasks. It was also revealed that the high performers were not as influenced by whether uncertainty was presented in terms of probabilities or in terms of frequencies as was the low performers.

With regard to social value orientation the results revealed that the decision processing differences were more systematic between the cooperators and the competitors than between the cooperators and the individualists. Also, the cooperators did not seem to attend more to pro-environmental goals than to profit goals in their evaluation of the job candidates. Finally, it was shown that the response latency time was significantly higher for cooperators that were accountable for their decisions than for those that were not accountable.

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