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VALUE ORIENTATION AND INCOME AND DISPLACEMENT EFFECTS

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WORKING PAPER NO. 78
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Value Orientations and Income and Displacement Effects

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Abstract

Identifying the value orientations of subjects participating in market or non-market decisions may be helpful in understanding the behaviour of these subjects. This experiment presents the results of changes in the origin and the radius of the value orientations *ring game* or *decomposed game* in an attempt to discover if the value orientations exhibit income or displacement effects. One hundred and thirteen subjects participated in three treatments. The results indicate that the differences between the resulting distributions of value orientations are by category are not significant, but that if the angle of the value orientation aggregate vector is used as a continuous measure of value orientation, a significant displacement effect is identified which suggests increases in cooperative value orientations when the ring is shifted so that it includes only positive values.

Value Orientations and Income and Displacement Effects

1. INTRODUCTION

Recent studies of voluntary contribution mechanisms have introduced a measure of value orientations as a control variable for understanding the cooperative behaviour which is displayed in many investigations of behaviour when individuals face social dilemmas in which the conventional economic theory does not predict cooperative behaviour (Brown, Cameron, and Chapman, 1996; Mestelman and Shehata, 1996; Offerman, Sonnemans, and Schram, 1996). In spite of its widespread use in psychology (a brief summary is presented in Cameron, Brown, and Chapman, 1996) there has been no research into the sensitivity of aspects of the mechanisms used to elicit value orientations which may be of particular interest to economists. In particular, for the *ring game* mechanism that generates a measure of value orientations several components can be manipulated. One is the magnitude of the payoffs presented to the subjects and another is the use of negative and positive payoffs versus only positive payoffs. The former is important because if subjects are paid to participate in these environments, experimenters should be confident that the resulting value orientations are not sensitive to the stakes, but rather are underlying behavioural attitudes. The latter is important because individuals may respond differently to negative payoffs than to positive payoffs and so the frame of the mechanism may provide different results. Furthermore, if the experimenter is going to use an environment in which only positive payoffs are realized by subjects, it may be desirable to use a mechanism to elicit value orientations which is consistent with this environment (particularly if value orientations are sensitive to this manipulation).

This experiment presents the results of changes in the origin and the radius of the value orientations *ring game* in an attempt to identify the existence of income and displacement effects.

The results indicate that the differences between the resulting distributions of value orientations by category are not significant, but that if the angle of the value orientation aggregate vector is used as a continuous measure of value orientation, a significant displacement effect is identified which suggests increases in cooperative value orientations when the ring is shifted so that it includes only positive values. For the subjects in this experiment the displacement effect suggested a more cooperative subject pool resulted from choices consisting only of positive values.

2. VALUE ORIENTATIONS

Griesinger and Livingston (1973) were the first to explicitly use a geometric model to characterize the motives behind individual choice behaviour. They used *decomposed games* to distinguish people as own-gain maximizers, joint-gain maximizers, and relative-gain maximizers. They test the validity of their mechanism by using three sets of instructions which tell subjects either to 1) be concerned about their own and their peer's welfare, 2) be concerned about only their own welfare, or 3) try to "get as far ahead" of their peer as possible. In each set of instructions, the subject is told that his peer will be trying to do the same thing as he is instructed to do. Griesinger and Livingston found that subjects behaved as instructed, and except for confounding strategic errors, the outcome was as expected from the geometric model. This is offered as proof of the validity of the mechanism. By not identifying the subject's peer whose resources are affected by the subject's decisions, and by providing no feedback on the behaviour of the peer until the subject has made all of his decisions, Griesinger and Livingston argue that they would expect to see neither strategic nor sex related effects on value orientations. This they

argue is an indication of reliability[1]

Liebrand (1984) employs the Griesinger and Livingston geometric model to characterize the relationship between preferred distributions of resources and the value orientations of individuals. Leibrand uses a *ring game* (presented in section 3 below) similar to that described by Griesinger and Livingston to categorize individuals as having altruistic, cooperative, individualistic, competitive, or aggressive value orientations according to the way in which they select among pairs of resource distributions between themselves and their peers.

Altruistic individuals will choose to select distributions of payoffs which favour their peers regardless of the payoff to themselves. Cooperative individuals will select distributions of payoffs which maximize the total payoff to themselves and their peers, while individualistic individuals always select the distributions of payoffs for which they receive the greatest return. Competitive individuals select distributions of payoffs for which the difference between their own returns and their peers' returns are maximized (the positive difference is as large as possible or the negative difference is as small as possible). Finally, aggressive individuals will always select the distribution of payoffs for which their peers received the lowest return. Liebrand uses the *ring game* mechanism and implicitly assumes the results are valid and reliable.

MacCrimmon and Messick (1976) consider *decomposed games* in which the subject's payoffs and the peer's payoffs increase monotonically. This restricts the mechanism for identifying value orientations to the portion of Griesinger's and Livingston's *ring game* which lies in the northwest quadrant of the resource distribution space (the subject's payoffs are negative but

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[1] This is supported by Wyer (1969) who suggests these procedures are necessary to separate motives from strategic behaviour when using *decomposed games*.

his peer's payoffs are positive), but which is displaced into the positive (northeast) quadrant. No attempt is made to determine if this transformation generates results which are consistent with the original mechanism.

3. THE *RING GAME*

The mechanism by which these value orientations are elicited is called a *decomposed game* A particular form of *decomposed game* is the *ring game* (see Cameron, Brown, and Chapman, 1996, for a different type of *decomposed game*). The *ring game* is used to generate a value orientation for a subject by presenting the subject with a series of choices between distributions of resources, or payoffs. Each distribution contains a payoff for the subject and a payoff for an anonymous peer. For each decision, two distributions are presented to the subject. The pairs of distributions are selected in a particular way.

Figure 1 displays values for two *ring games.* The horizontal axis shows payoffs to player 1 (the subject) and the vertical axis shows payoffs to player 2, the subject's anonymous peer. Refer to the ring with the larger radius made up of points identified with open boxes. This ring has a radius of 150 units of laboratory currency. One resource distribution is represented by the point at (150, 0). This would return 150 francs to the subject, but nothing to his peer. Moving counterclockwise from this point, the distributions are (145, 39), (130, 75), (106, 106), (75, 130), (39, 145) and (0, 150). As we move counterclockwise around the ring, the numbers associated with the distributions following the same pattern as displayed by the first seven distributions, only values for the subject become negative and the postive values for the peer fall to (-39, 145), (-75, 130) and so on. The distributions are equally spaced around the ring.

The subjects are presented with pairs of adjacent distributions, such as [(150,0), (145, 39)], [(145,39), (130, 75)] and so on. There are twenty-four pairs of distributions. The pairs of distributions are randomized and presented to the subjects. The subjects select a preferred distribution from each pair. The resulting twenty-four choices, representing twenty-four vectors of length 150 are added. The angle of the resulting vector is used to assign a value orientation to the subject and the ratio of the length of the resultant vector to 300 is a measure of the consistency of the subject's choices (see Offerman, Sonnemans, and Schram, 1996).

If the subject always selects the distribution which contains his largest payoff, the resultant vector will have a length of 300 and the angle it forms with the horizontal axis will be zero. If the subject always selects the distribution which maximizes the total payoff to the subject and his peer, the resultant vector will have a length of 300 and will be forty-five degrees above the horizontal axis in the northeast quadrant. Similarly, if the subject always selects the distributions which maximizes the difference between his payoff and his peer's payoff, the resultant angle will be forty-five degrees below the horizontal axis in the southeast quadrant.

The cooperative, individualistic, and competitive ranges of value orientations are identified in Figure 1 by the rays from the origin at 67.5 degrees, 22.5 degrees, -22.5 degrees, and -67.5 degrees. Cooperative behave is associated with a resultant angle lying between 67.5 and 22.5 degrees. Individualistic behaviour falls between 22.5 and -22.5 degrees, while competitive behaviour falls between -22.5 and -67.5 degrees. A resultant angle greater than 67.5 degrees identifies an altruist while an angle less than -67.5 identifies an aggressive individual.

4. THE TREATMENTS AND THE EXPERIMENT

The pairs of payoff distributions associated with each decision opportunity in each of the three different *ring games* are presented in Table 1. The subjects were paid according to the decisions they made when confronted with seventy-two different choices between two distributions of payoffs. The three *ring games* are shown in Figures 1 and 2. In Figure 1 the treatment variable is the radius of the ring. In one case it is 100 units of laboratory currency and in the second it is 150 units of laboratory currency. Figure 2 displays a ring with radius 100, but this ring is displaced so that its centre is at (100,100) rather than (0, 0). In this environment the subject never experiences distributions with negative payoffs. While the payoffs are presented in the same units of laboratory currency, they are converted into Canadian dollars at a rate which is different from that used for the first two rings. The exchange rate is selected to make the payoff for a subject who is a consistent individualist in game 3 comparable to that which would be realized by an individual who is a consistent individualist in game 1.

The research question is to identify any income or displacement effects associated with increasing the radius of the ring or displacing the origin of the ring respectfully. If neither income nor displacement effects arise, the *ring game* may be expected to generate value orientations which will be invariant to decision-making environments in which payoffs may be negative or positive or in which payoffs may vary over decision rounds. Income or displacement effects would suggest that care must be taken when using the *ring game* to determine value orientations which will be used to help account for the behaviour of subjects in decision environments in which subjects are rewarded according to their performances.

One hundred and thirteen subjects were recruited from second year accounting classes at

McMaster University. These subjects participated in two rounds of decision-making in a large testing centre in which each person sat at a separate table. The decision-making rounds were run sequentially and the session lasted for about ninety minutes. The average earnings from the subjects' own payoffs was $30 and the average earnings from the subjects' peers decisions was $12.

In the first round of decision-making the subjects were presented with the twenty-four game 3 opportunities listed in Table 1. In the second round of decision-making they were presented with the forty-eight game 1 and game 2 opportunities. The pairs of payoff distributions were displayed on a large screen in the testing centre. They were not presented in the order listed in the table, but were randomized (the games 1 and 2 pairs were pooled and randomized) . The order of presentation of the A distribution and the B distribution (one on the right and one on the left) was also randomized.

5. RESULTS

5.1. Summaries of Orientations

Summary statistics which describe the mean, standard deviation, and range of resultant vectors under each treatment are presented in Table 2. For each treatment the mean resultant angle categorized the central tendency of the subjects in this experiment as individualists. However, a ninety percent confidence band around the mean for each treatment overlaps into the cooperative range. No subject fell into the altruist range.

The resultant angle data pooled into eleven ranges for each treatment are displayed in Figure 3. The two ranges at the ends of the distributions include observations greater than 67.5

degrees or observations less than -67.5 degrees. The remaining nine observations have their mid-points at -60, -45, -30, -15, 0, 15, 30, 45, and 60 degrees. Each band is 15 degrees in "length". The band with the mid-point at 0 includes both endpoints (-7.5 and 7.5), the bands with mid-points having negative values include only the lower end of the band, while the bands with mid-points having positive values include only the higher end of the band. The data displayed in Figure 3 suggest that while the distributions for treatments whose rings are not displaced appear to coincide, the treatment whose ring is displaced appears to have observations shifted from the individualistic range to the cooperative range.

Table 3 contains summary results which further confirm the consistency of value orientations consistent with individualistic behaviour or cooperative orientations. Opportunities 4, 5, 6, 16, 17, and 18 permit the identification of a strong altruistic orientation. The choice of alternative B in the first three opportunities and of A in the last three are consistent with *only* an altruistic orientation. Altruistic choices occur in fewer than two percent of the opportunities in games 1 and 2, while this frequency more than doubles when the ring is displaced in game 3. The opposite extreme, the aggressive orientation, is identifiable in opportunities 7, 8, 9, 19, 20, and 21. Once again, the subjects selected the extreme choices more frequently when the ring was displaced, but the frequency of this choice never exceeded two percent of the opportunities.

Finally, opportunities 10, 11, 12, 22, 23, and 24 can identify either aggressive or competitive orientations. Choices consistent with these orientations occur in approximately four percent of the opportunities across the three treatments (with not much difference across treatments). After accounting for eighteen of the twenty-four opportunities, and assuming subjects are consistent in their decisions and no overlap between aggressive and competitive

orientations, less than seven percent of the individuals would be included among those with altruistic, competitive, or aggressive orientations. This leaves more than ninety percent of the subjects to be divided between cooperative and individualistic individuals.

Opportunities 1, 2, 3, 13, 14, and 15 help do this. The data summaried inTable 3 suggest that the split between cooperative and individualistic orientation is most pronounced when the subject trades off a small amount of payoff and the peer receives a relatively larger increase in payoff. When the payoffs are defined over losses (negative values in opportunities 13, 14, and 15) the frequency of cooperation declines more rapidly as the cost of cooperation increases than it does when payoffs are defined over gains. More than two-thirds of the choices suggest individualistic orientations.

5.2. Consistency

The test for internal consistency of the decisions made by each subject for each treatment described by Offerman *et al.* yields the frequency distributions shown in Figure 4. The ranges at the ends of the distributions include all values less than 0.82 at the lower end and all values at 1.00 at the upper end. The remaining ranges are of magnitude 0.03 and do not include the upper bound of the range (0.85, 0.88, 0.91, 0.94, 0.97, and 1.00 for the ranges with mid-points at 0.835, 0.865, 0.895, 0.925, 0.955, and 0.985 respectively). The mean consistency measures are 0.97, 0.97 and 0.94 for games 1, 2, and 3 respectively. These results are consistent with those reported by Offerman *et al.* for *ring games* in which subjects are paid according to their decisions.

Another measure of consistency is to compare the decisions made by individuals across treatments. Table 4 shows the proportion of consistent choices across the different treatments by opportunity. Of particular interest is whether increasing the radius of the ring affects decisions

and whether displacing the ring (while keeping the radius the same) affects decisions. The data summaried in Table 4 suggest that except for decisions made in opportunities 1, 2, 3, 13, 14, and 15, the decisions made by individuals in game 1 are very consistent with those they make in games 2 and 3. In the six opportunities in which individualistic and cooperative orientations can be distinguished, there are many more inconsistencies. For example, when opportunity 1 is presented, sixty-nine percent of the individuals make the same decision when the the ring radius is 100 and when it is 150. Seventy-three percent of the people make the same decision when the ring radius is 100 but displaced from the origin as when the ring is centred at the origin. Finally, overall, only fifty-eight percent of the people make the same decision under each treatment.

A final view of consistency is presented in Table 5 and Figure 5. The table and the figure present alternative representations of the relationship between the resultant vector for each subject in game 1 (radius of 100) and the corresponding resultant vector for that individual in game 2 (radius of 150) and game 3 (displaced radius of 100). Given the orientation revealled in game 1, consistent behaviour would result in the black dots and open dots in Figure 5 falling along a straight line with slope of unity. With respect to Table 5, all of the off diagonal values would be zero and the diagonal values would be the same across the two matrices. There is a tendency for the data to fit a line with slope of unity through the origin in Figure 5, but there is much variation in the data. The variation around this line of the open dots appears to be greater than that of the black dots.

5.3. Summary Observations

An analysis of variance using the 339 observations from 113 subjects in the three treatments indicates that neither increasing the radius of the ring from 100 to 150 nor displacing

the origin of the ring with a radius of 100 has a statistically significant effect on the mean resultant angle after accounting for subject specific effects (which are significant). The p-values associated with the income and displacement effects are 0.234 and 0.589 respectively (and with the subject effect is 0.000).

Observation 1. The means of the distributions of resultant angles exhibit neither income nor displacement effects.

If the resultant angle for each subject is used to categorize subjects as altruistic, cooperative, individualistic, competitive, or aggressive, the null hypothesis that the resulting distributions of value orientations by category for games 1 and 2 and games 1 and 3 are identical cannot be rejected using either the Wilcoxon Signed-Ranks Test ($p = 1.000$ and $p = 0.345$, two-tail z-test, respectively) or a Chi-Squared Test ($\chi^2 = 0.244$, $p = 0.885$ and $\chi^2 = 2.360$, $p = 0.501$).

Observation 2. The distribution of value orientations exhibit neither income nor displacement effects.

When the angle of the resultant vector is used to identify an individual's value orientation and the resulting frequency distribution of vector angles is reported as in Figure 3, pooling the observations in the tails so that the ends of the range contains values greater than 45 degrees or less than -45 degrees will not provide evidence of income or displacement effects. A test of the null hypotheses that the distributions coming from games 1 and 2 are identical and the distributions coming from games 1 and 3 are identical cannot be rejected ($\chi^2 = 5.344$, $p = 0.500$ and $\chi^2 = 6.128$, $p = 0.409$ respectively).

Observation 3. Histograms representing the distributions of resultant angles exhibit neither income nor displacement effects.

When the resultant angles for each of the 113 subjects from game 1 are compared with those from games 2 and 3, the correlation coefficient between the resultant angles associated with the income effect is approximately fifty percent larger than that associated with the displacement effect (0.837 and 0.559). This result is invariant to the exclusion of subjects whose internal consistency percentage associated with the resultant angle for any game is less than eighty-five percent. This suggests that when a continuous measure of value orientation is used to characterize the subjects in this experiment

Observation 4. the displacement effect leads to less consistent results than the income effect, relative to game 1 as a baseline.

This fourth point is reflected in Figure 5 by the visually smaller variance around the trend line that could pass through the solid dots relative to the variance around the trend line that could pass through the open dots.

If the resultant angle is used as a measure of value orientation, the null hypothesis that the distributions from game 1 and game 3 are identical cannot be rejected using a Wilcoxon Signed-Ranks Test, but the same null hypothesis can be rejected for the distributions from games 1 and 2 ($p = 0.720$ and $p = 0.029$, two-tail z-test, respectively). This suggests that when a continuous measure of value orientation is used to characterize the subjects in this experiment

Observation 5. there is a significant income effect but not a significant displacement effect.

This result is also reflected in Figure 5. The regression line drawn through the solid dots and the open dots have slopes less than unity. However, the greater variance of the open dots makes it difficult to reject the null hypothesis that the slope is different from unity. This is not the case

with the solid dots.

6. CONCLUDING COMMENTS

The use of the *ring game* to generate an indicator of the value orientations of individuals who may participate in laboratory decision-making environments is an intriguing prospect. If a subject's value orientation is separable from the payoff function induced in the laboratory, identifying a measure of the value orientation may help explain the cooperative behaviour which is frequently observed in environments in which cooperative behaviour is not predicted by the conventional economic behavioural model. However, it is not obvious that the *ring game* will generate a measure of value orientation which is consistent across parameterizations.

The three games presented in this paper describe three different environments. The baseline environment is arbitrarily chosen to be that whose ring is centred at the payoff distribution (0, 0) and whose payoffs are restricted by the radius of 100 laboratory monetary units. The next environment is one in which the payoffs to subjects is increased by increasing the radius to 150. Because the conversion rate from laboratory monetary units to conventional currency is the same for these games, the second game introduces an income effect. It would be important to know if increasing the potential income effects the value orientation of subjects. The results here suggest that if value orientation is defined by category, there is no significant income effect. However, if value orientation is defined as a continuous variable, there is an income effect. In this experiment the income effect reduces the value orientation measure.

When only positive *decomposed games* are used (game 3), neither does the displacement effect lead to a significant change in the distribution of the resulting value orientations by category

nor does the distribution of the continuous value orientation measure change significantly. This result follows from the increased variance in the continuous measure relative to the baseline values from game 1.

A tentative conclusion from these experiments is that if the *ring game* is used to identify the value orientations of subjects who will participate in laboratory sessions, and if the subjects are going to be paid according to the decisions they make in the *ring game*, a single ring with twenty-four opportunities is sufficient to generate a measure of the subjects' value orientations. A second is if value orientation is going to be used as a dummy variable, it may be not necessary to be concerned about income or displacement effects when selecting to use a *ring game* with gains and losses or only gains. Finally, if a continuous measure is used to control for value orientations of subjects and the *ring game* will not be administered at one time to all the subjects who will participate in the sessions of an experiment, the ring with its origin at (0, 0) would be preferred. Any income effects which might occur over time (subjects are at the end of the school year and funds are low and so payoffs in the laboratory are more important than they might be at another time of the year) may be less important than having a relationship that is relatively consistent. This experiment, however, does not provide any information on the effect of a change in the ring's radius if it has been displaced from the origin (0, 0).

If the inclusion of value orientation measures proves to be useful in accounting for behaviour that has been inconsistent with conventional economic theory, it will be necessary to continue to work on discovering the extent to which this measure changes as the environment in which the subject participates changes. In particular, the measure is derived from a *decomposed game*. Many of the environments economists study in controlled settings are interactive. Does

this effect the relevance of the value orientation measure?

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Table 1. Pairs of Payoff Distributions in Each Decision Opportunity of Each Treatment

	Game 2 (Radius = 150)		Game 1 (Radius = 100)		Game 3 (Displaced Radius = 100)	
	Alternatives					
Opportunity	A	B	A	B	A	B
1	150, 0	145, 39	100, 0	97, 26	200, 100	197, 126
2	145, 39	130, 75	97, 26	87, 50	197, 126	187, 150
3	130, 75	106, 106	87, 50	71, 71	187, 150	171, 171
4	106, 106	75, 130	71, 71	50, 87	171, 171	150. 187
5	75, 130	39, 145	50, 87	26, 97	150. 187	126, 197
6	39, 145	0, 150	26, 97	0, 100	126, 197	100, 200
7	0, 150	-39, 145	0, 100	-26, 97	100, 200	74, 197
8	-39, 145	-75, 130	-26, 97	-50, 87	74, 197	50, 187
9	-75, 130	-106, 106	-50, 87	-71, 71	50, 187	29, 171
10	-106, 106	-130, 75	-71, 71	-87, 50	29, 171	13, 150
11	-130, 75	-145, 39	-87, 50	-97, 26	13, 150	3, 126
12	-145, 39	-150, 0	-97, 26	-100, 0	3, 126	0, 100
13	-150, 0	-145, -39	-100, 0	-97, -26	0, 100	3, 74
14	-145, -39	-130, -75	-97, -26	-87, -50	3, 74	13, 50
15	-130, -75	-106, -106	-87, -50	-71, -71	13, 50	29, 29
16	-106, -106	-75, -130	-71, -71	-50, -87	29, 29	50, 13
17	-75, -130	-39, -145	-50, -87	-26, -97	50, 13	74, 3
18	-39, -145	0, -150	-26, -97	0, -100	74, 3	100, 0
19	0, -150	39, -145	0, -100	26, -97	100, 0	126, 3
20	39, -145	75, -130	26, -97	50, -87	126, 3	150, 13
21	75, -130	106, -106	50, -87	71, -71	150, 13	171, 29
22	106, -106	130, -75	71, -71	87, -50	171, 29	187, 50
23	130, -75	145, -39	87, -50	97, -26	187, 50	197, 74
24	145, -39	150, 0	97, -26	100, 0	197, 74	200, 100

Table 2. Summary Statistics[1]

Treatments	Mean Vector Angle	Standard Deviation	Range of Angle (A)
Game 1 (Radius 100)	13.02	16.31	-47.62<A<52.18
Game 2 (Radius 150)	11.35	13.45	-28.82<A<50.12
Game 3 (Radius 100, displaced)	13.78	11.35	-81.26<A<61.14

[1] Angles are measured in degrees. A vector with an angle between -22.5° and 22.5° identifies an individual whose value orientation is "individualistic".

Table 3. Proportion of Choices that are Alternative A in Each of Twenty-Four Opportunities[1]

Opportunity	Game 1 (r=100)	Game 2 (r=150)	Game 3 (r=100d)[2]	Comments
1	0.43	0.46	0.54	B is consistent
2	0.73	0.76	0.73	with altruistic or
3	0.78	0.87	0.72	cooperative behaviour
4	0.98	1.00	0.96	B is consistent
5	0.99	1.00	0.94	with altruistic
6	1.00	1.00	0.97	behaviour
7	1.00	1.00	0.98	B is consistent
8	1.00	0.99	0.98	with aggressive
9	1.00	1.00	0.97	behaviour
10	0.95	0.97	0.97	B is consistent
11	0.98	0.97	0.96	with aggressive
12	0.94	0.90	0.96	or competitive behaviour
13	0.59	0.58	0.50	A is consistent
14	0.19	0.21	0.31	with altruistic or
15	0.11	0.04	0.14	cooperative behaviour
16	0.03	0.03	0.08	A is consistent
17	0.02	0.00	0.05	with altruistic
18	0.02	0.04	0.03	behaviour
19	0.00	0.01	0.02	A is consistent
20	0.02	0.01	0.01	with aggressive
21	0.00	0.01	0.00	behaviour
22	0.05	0.02	0.04	A is consistent
23	0.03	0.03	0.03	with aggressive
24	0.04	0.04	0.05	or competitive behaviour

[1] Choices are always given between adjacent pairs of points on the rings shown in Figures 1 and 2. The move around the ring from alternative A to alternative B is counter-clockwise.

[2] The ring in Game 3 has a radius of 100, but it is displaced so that the origin is at (100, 100).

Table 4. Proportion of Consistent Choices across Games by Opportunity[1]

Opportunity	Game 1 and Game 2	Game 1 and Game 3	All Games
1	0.69	0.73	0.58
2	0.73	0.72	0.65
3	0.81	0.73	0.63
4	0.98	0.95	0.95
5	0.99	0.93	0.93
6	1.00	0.97	0.97
7	1.00	0.98	0.98
8	0.99	0.98	0.98
9	1.00	0.97	0.97
10	0.96	0.94	0.93
11	0.97	0.98	0.96
12	0.91	0.94	0.88
13	0.86	0.72	0.63
14	0.81	0.68	0.58
15	0.88	0.82	0.77
16	0.95	0.91	0.88
17	0.98	0.95	0.93
18	0.95	0.96	0.93
19	0.99	0.98	0.97
20	0.97	0.99	0.97
21	0.99	1.00	0.99
22	0.96	0.95	0.93
23	0.96	0.98	0.95
24	0.95	0.96	0.92

[1] The proportion reported in this table is the proportion of 113 subjects who selected the same alternative in opportunity i in Games 1 and 2, Games 1 and 3, and in all three games (i = 1,...,24).

Table 5. Distribution of Value Orientations by Categories and Across Treatments

Game 1 (Radius of 100)	Game 2 (Radius of 150)					Game 3 (Displaced Radius of 100)				
	Categories[1]					Categories				
Categories	I	II	III	IV	V	I	II	III	IV	V
I	**0**	0	0	0	0	**0**	0	0	0	0
II	0	**16**	9	0	0	0	**14**	11	0	0
III	0	8	**77**	0	0	0	18	**65**	1	1
IV	0	0	1	**2**	0	0	0	2	**1**	0
V	0	0	0	0	**0**	0	0	0	0	**0**

[1] Categories I, II, III, IV, and V identify individuals whose value orientation classifications are altruistic, cooperative, individualistic, competitive, and aggressive respectively.

Fig. 1 Ring Games 1 & 2

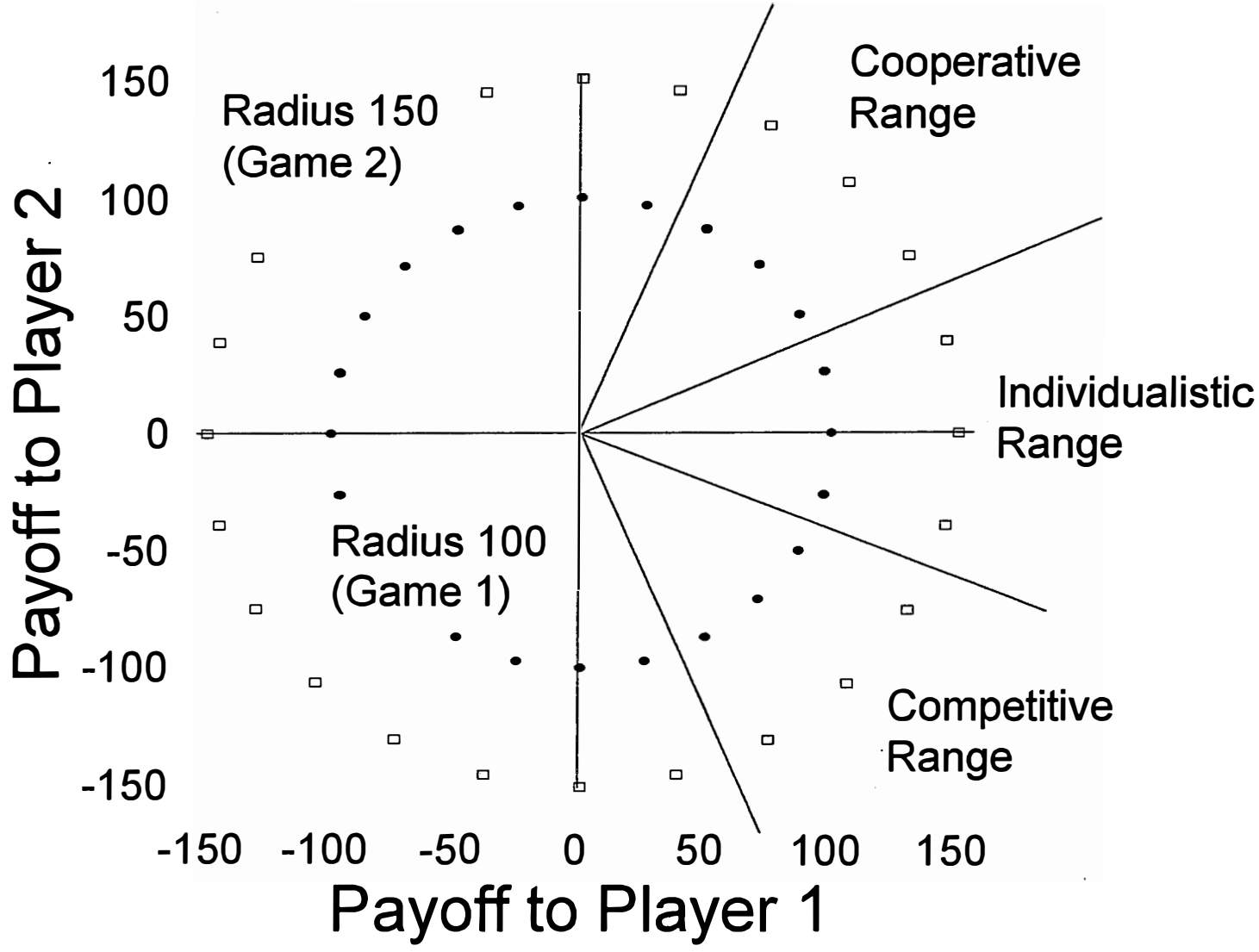


Fig. 2 Ring Game 3

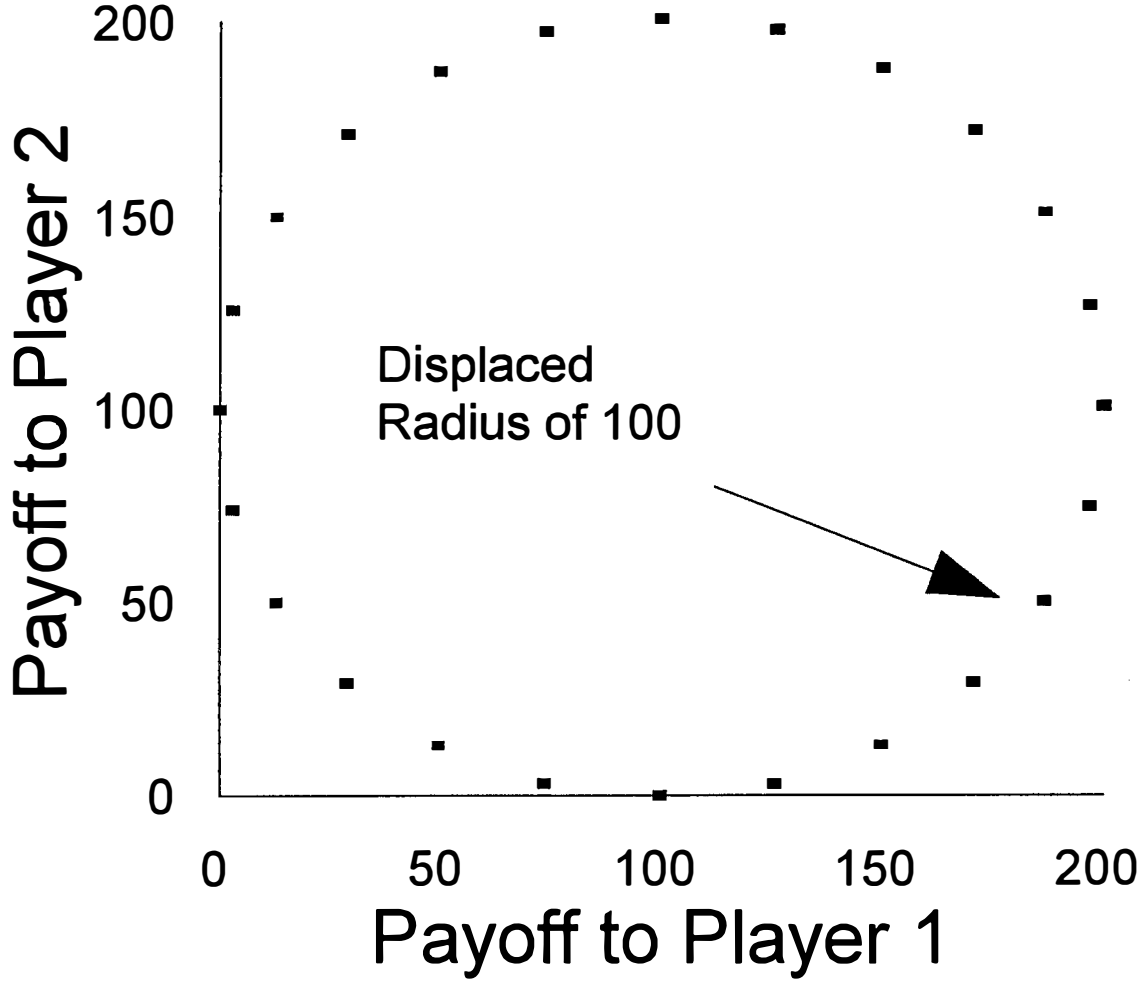


Fig. 3 Distribution of Vector Angles

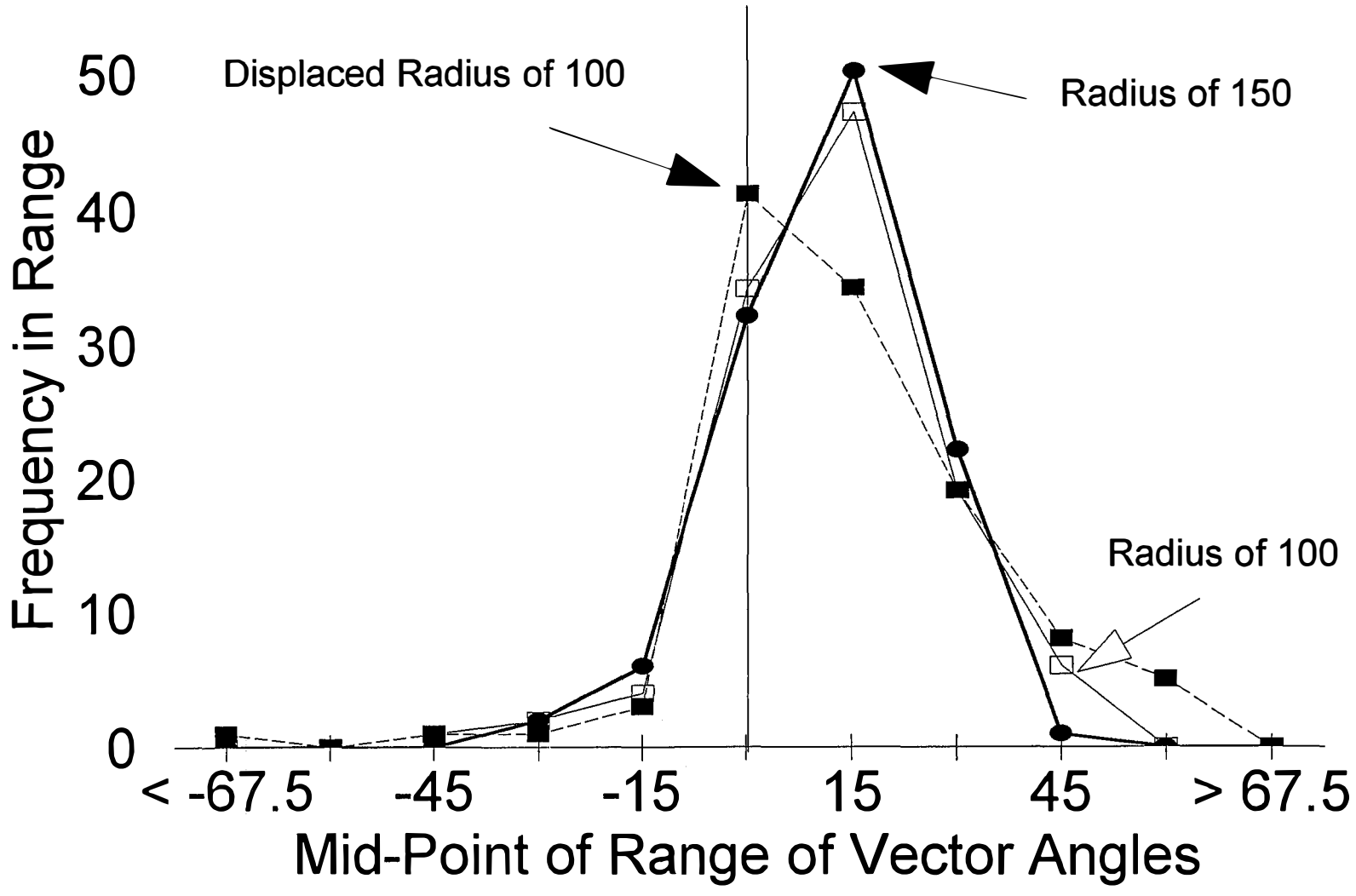


Fig. 4 Consistency Measures (Distributions)

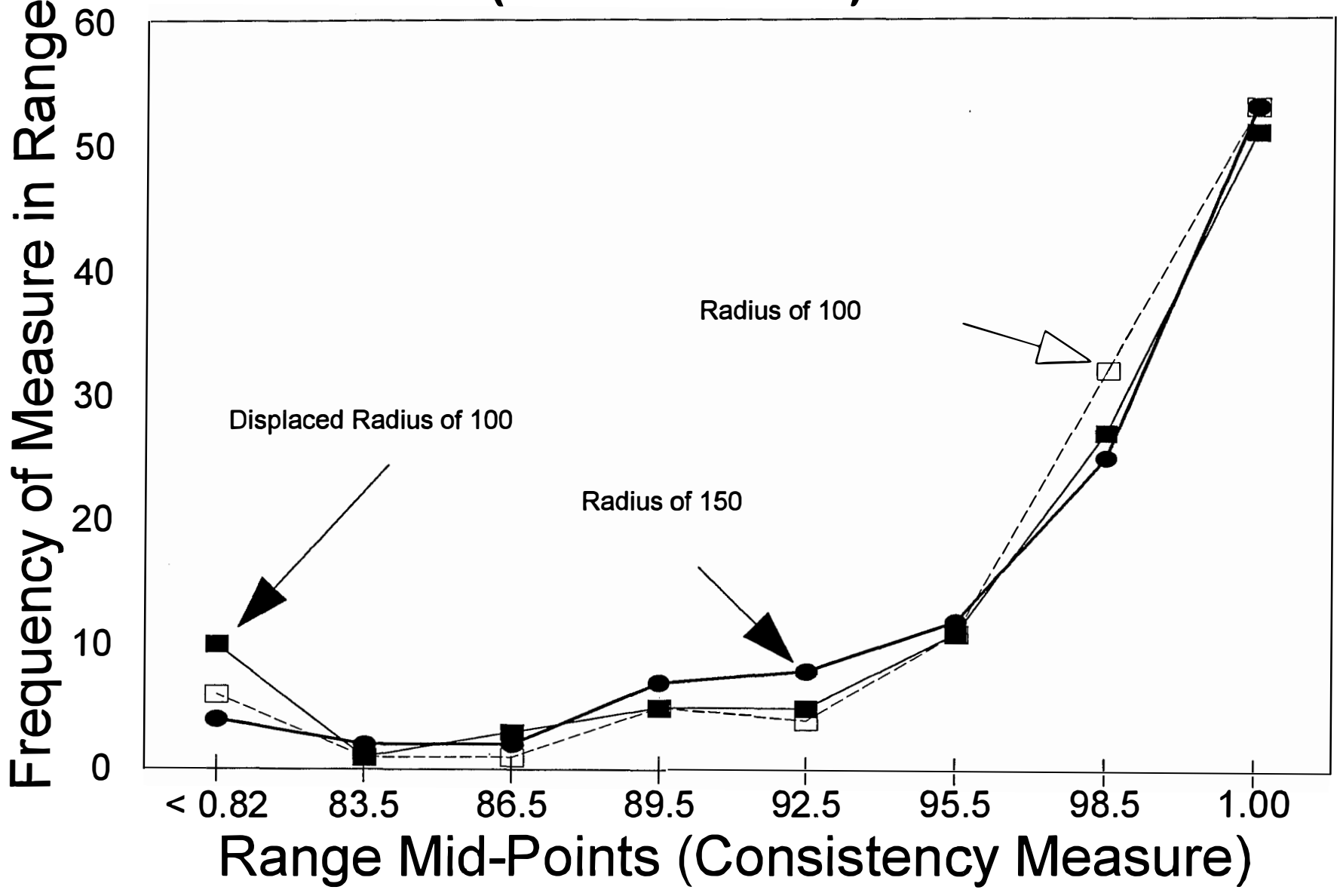
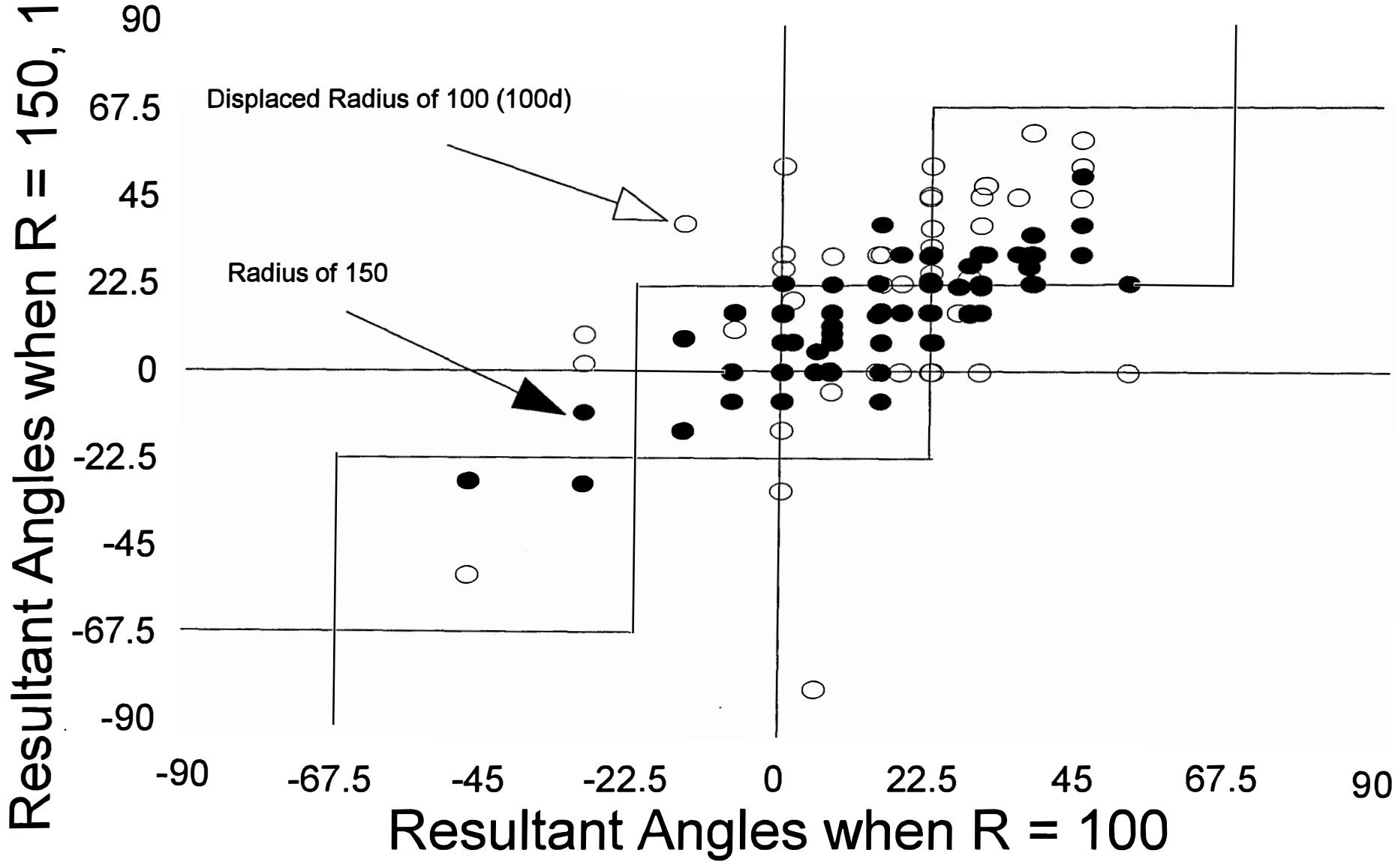


Fig. 5 Consistency of Vector Angles



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