RESPONSE LATENCIES IN A SOCIAL CONFORMITY

PARADIGM; EFFECTS OF A REFERENT'S COMPETENCE

by

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Thesis submitted to the Graduate Faculty of the

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Psychology

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August, 1975

Blacksburg, Virginia

ACKNOWLEDGMENTS

The author would like to express his appreciation to the following:

for his support and professional guidance concerning every aspect of the research and analysis.

for his suggestions and advice concerning the manuscript.

for his comments and helpful advice.

National Institute of Mental Health for financial support under Grant (awarded to), without which the accomplishment of this research would have been impossible.

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INTRODUCTION

The standard methodology used by social psychologists to determine the influence of another person's decisions on a subject's decisions has involved a confederate of the experimenter making a judgment prior to the subject's judgment. The dependent variable in such experiments was typically the frequency of times that subjects conformed to the confederate's choice. Sherif (1935, 1936) used this paradigm to demonstrate that the autokinetic phenomenon could be influenced by prior judgments of other persons. Asch (1951, 1956) used a variation of this basic conformity procedure to show that college males would make obviously incorrect matches between a stimulus and an unambigious comparison stimuli when one or more confederates made an incorrect match prior to the subject's response. The Asch procedure was refined by Crutchfield (1955) and Deutsch and Gerard (1955) to eliminate bias due to face-to-face interactions by isolating subjects in booths and using panel lights to indicate the judgments of coactors prior to presenting comparison stimuli for the subject's judgment.

While the Sherif paradigm demonstrated the conformity effect (i.e., subject's judgments of perceived movements of a pinpoint of light were influenced by other persons' judgments) the paradigm required that subjects make decisions about ambigious stimuli which were not clearly correct nor incorrect. On the other hand, conformity in the Asch technique was defined as agreeing with a unanimous majorities incorrect choice. Thus, these traditional paradigms required individuals to make decisions which were actually incongruent with the usual everyday decisions that may be influenced by others (i.e., decisions based on cumulative sources of information).

The Asch and Crutchfield paradigms that defined conformity as individuals making the same incorrect decision given by a "pressure group" implicated possible confounding variables and ethical concerns. According to Aronson and Carlsmith (1968), frequent occurrences of judgments that disagree with the subject's own sensations detract from the realism of the situation. Also, as McGuire (1969) proposed, the Asch and Crutchfield paradigms may result in an artifact due to the subject's suspiciousness of the experimenter's intentions. In fact, Allen and Levine (1971) reported that when using a Crutchfield paradigm, 32 of 189 subjects in one study and 14 out of 137 subjects in a different study reported knowledge of deception during post-experimental inquiries. In addition, Nosanchuk and Lightstone (1974) found that "subject's typically have found participation in such studies painful ....for the first time in a subject's life, his own sense impressions and verbal reports of others are in sharp disagreement" (p. 153).

The present study implemented a conformity paradigm in which stimulus comparisons were not ambigious and the subject was not required to make an obviously incorrect decision in order to conform. More specifically, on each of 300 trials subjects predicted which one of the two stimuli would appear on a stimulus screen after observing a reference prediction (R). The presentation of R started a decision timer which stopped with the subject's stimulus prediction. Then the stimulus presentation occurred and the subject identified the stimulus as quickly as possible by pulling a left or right-hand reaction trigger. Hence, besides the standard measure of conformity (i.e., the frequency that the subject's predictions agreed with _R_), the present experiment studied two other dependent variables; decision time (i.e., the interval between _R_ and the subject's prediction), and choice reaction time (i.e., the interval between the stimulus presentation and the subject's choice reaction). It is noteworthy that Crutchfield (1955) also recorded the latency of each individual's response following the presentation of coactor's judgments, but the latency data was not presented in the publication.

COMPETENCE IN CONFORMITY PARADIGMS

A manipulated variable which has been given much consideration in recent conformity literature is the relative competence of the subject and/or the "pressure group". The paradigm for this research was usually a two-stage experiment in which confederates of the experimenter and the subject made judgments in two different tasks, or two stages of the same task. These methodologies may be termed "successive" manipulations since competence is varied from one stage to a later stage of the experiment. For example, Wiesenthal, Endler, Coward and Edwards (1974) used a successive two-task methodology in which they manipulated subject correctness relative to a group by providing each individual subject (at the start of the second task) with feedback indicating the number of correct judgments that each individual had made in the prior task. The results showed that subjects conformed more on a spatial judgment task when they were less competent than when they were more competent on a prior dot estimation task.

A two-task manipulation of perceived competence was also used by Croner and Willis (1961). They showed that when the prior task was more similiar to the subsequent task there was a greater asymmetry of influence. Ettinger, Marino, Endler, Geller and Natziuk (1971) used a successive, single task methodology to demonstrate that subjects' competence on prior trials influenced conformity on subsequent trials in a direction supporting the results of Croner and Willis. Other studies using the successive competence manipulation (Geller, Endler and Wiesenthal, 1974; Endler and Hartley, 1974; Mausner, 1954; Rosenberg, 1961) have typically found that the greater the perceived competence of the subject in a prior task (or prior trials of the same task) the less conformity demonstrated in a subsequent task (or later trials of the same task). On the other hand, Macaranas and Savell (1973) obtained results which contradicted the general conclusion that increased perception of personal competence on a prior task decreases subsequent conformity. Specifically, in a 20-event probability learning task, third grade children who were successful agreed more often with the picture preferences of an adult or another child than did the unsuccessful children.

Recently a paradigm was introduced that studied the effects of competence in a situation that did not require a separation of the subject's perceived competence between 2 tasks or through a separation of trials within the same task (i.e., a successive competence manipulation). Geller (in press) varied competence by using a continuous rather than a successive experimental manipulation. More specifically, Geller manipulated the competence of a coactor (and thus the subject's perceived competence) within a single continuous prediction and reaction time task. That is, a coactor and then the subject predicted which of two stimuli they expected to occur prior to each of 300 stimulus presentations. After each stimulus presentation, the subject identified the stimulus as quickly as possible by pulling a reaction trigger. On each trial latencies between the coactor's prediction and the subject's prediction and between the stimulus presentation and the subject's identification were recorded. Competence of the coactor was manipulated by controlling the frequency of correct predictions by the coactor. In one condition the coactor predicted the stimulus presentation correctly on 70% of the trials; while for two other groups of subjects, the coactor predicted correctly on 50% and 30% of the trials. Geller hypothesized that the latency between the coactor's and the subject's predictions (i.e., Decision Time, DT) would vary as a function of the coactor's prediction competency such that subject's decisions would be faster when agreeing with a competent coactor or disagreeing with an incompetent coactor. However, contrary to the hypotheses, the latency between the coactor's and the subject's predictions did not vary according to the coactor's prediction competence. He did report that for each condition subjects took a significantly longer time to disagree than to agree with the coactor's prediction, and subject's decision latencies were shorter when the subject had been correct rather than incorrect on the preceding trial. Analysis of the frequency of conforming response did not indicate a tendency to conform above a chance level. Thus, the decision latency data reflected a tendency for subjects to conform faster than to disagree, while the typical frequency measure did not indicate such a tendency toward conformity.

Geller was probably the first investigator to demonstrate significant effects of social variables on the speed to agree or disagree with another person's decision. However, other investigators have studied subject's decision latencies in human performance research. For example, early investigators recorded the speed at which subjects made a perceptual discrimination and found a direct relationship between subjects' decision speed and their estimated degree of confidence in perceptual judgments (e.g., Rosenbloom, 1929; Kellogg, 1931). Also, when subjects were forced to choose between two desired objects, the time required to indicate a choice depended upon overt measures of preference (Bergum and

Dooley, 1969; Geller, Whitman and Beamon, 1971; Siegel, Williams and Szako, 1968). In addition, Geller and Pitz (1968) studied the speed that subjects revised their opinions in a decision making task, while Pitz (1969) and Pitz and Geller (1970) measured the speed that subjects purchased information in a deferred decision making task. Thus, decision latencies have frequently been used to monitor subjects' cognitive processing. Indeed, Geller's paradigm fulfilled a suggestion by Gerard and Conolley (1972) that the latency between the judgments of a reference group and the subject's decision might be a worthwhile dependent variable in conformity research.

REACTION TIME AND INFORMATION PROCESSING

Donders (1868) designed the choice reaction time (RT) paradigm to determine an individual's information processing rate. In the standard two-stimulus, two-response RT situation, one of two possible stimuli is presented on each trial and the subject is required to make an identification as quickly as possible by making a prescribed response to one stimulus and another response to the alternative stimulus. As reviewed by Smith (1968) choice RT, the latency between a stimulus presentation and the identification response, reflects the amount of time necessary to perceive and encode a stimulus, and choose and execute a response. In addition to introducing a new paradigm for studing the effects of competence in a social conformity situation, Geller (in press) determined the effects of social variables on subjects'rate of information processing as measured by choice RT.

Bernstein and Reese (1965, 1967) required subjects to verbally predict which stimulus they expected to occur prior to each stimulus presentation and found that subjects reacted markedly faster when the stimulus had been predicted. This observation has been termed a prediction outcome effect, (e.g., Bernstein and Reese, 1965; Keele, 1969; Schvaneveldt and Chase, 1969; Williams, 1969).

Geller (in press) also found that subjects reacted faster to events which were correctly predicted than incorrectly predicted. Moreover, when Geller considered the coactor's competence as determinant of RT, he found that when the coactor was correct on 30% of the trials (a relatively incompetent coactor) subjects reacted faster when the coactor's prediction was incorrect rather than correct; while subjects with a relatively competent coactor (i.e., 70% correct) reacted faster when the coactor's prediction was correct rather than incorrect.

Expectancy notions have been used to explain variations in choice RT as a function of the experimental situation. Falmagne (1965), Geller (1974b), Geller and Pitz (1970) and Hinrichs and Krainz (1970) have used the expectancy notion to interpret the effect of prediction outcome on choice RT. These interpretations of RT data are based on the assumption of an inverse relationship between choice RT and the subject's expectancy for a given stimulus presentation. Thus, the assumption that subjects predict expected events accounts for the prediction outcome effect. Geller interpreted the effects of coactor's prediction competence on choice RT by assuming that an individual's expectancies were affected by the decision competence of another person. In particular, a subject's expectancy for a particular stimulus increased when a competent coactor predicted that stimulus, or when an incompetent coactor predicted the alternative stimulus.

RELEVANCE OF CURRENT RESEARCH

The paradigm introduced by Geller contained certain artifacts. First, when the coactor voiced his stimulus predictions, he did so with variable intonation from trial to trial. Thus, the coactor's verbal predictions at times indicated boredom and at other times enthusiasm. Further, since no more than 15% of the subjects in the experiment received the same coactor, it was probable that characteristics of the different coactors affected the subject's decision strategies (the subject and coactor did have face-to-face contact prior to the experiment, but did not see each other during the experiment). Another problem associated with the use of a confederate coactor was that the interval between the experimenter's verbal prompt, "prediction", and the coactor's prediction was variable and therefore the delay for the subject's prediction varied from trial to trial. On some trials subjects might have decided on a particular prediction prior to the coactor's prediction, and it was also possible that minor changes in the latency between the experimenter's prompt and the coactor's prediction influenced the subject's decision latency.

Another weakness of the Geller paradigm was the manner in which the coactor and the subject indicated their predictions. The decision timer started when the coactor made a verbal prediction and simultaneously pulled a response trigger. The decision timer stopped when the subject pulled a left- or right-hand response trigger. When pulling a trigger for a prediction the subject verbalized the stimulus indicated by the response trigger. So, it is possible that the coactor did not always make the verbal and trigger response simultaneously and therefore the decision timer did not always start with the coactor's verbal prediction. Also, the requirement that the subject first pull a trigger and then verbalize probably involved extra cognitive processes (e.g., remembering the stimulus-response mapping relationship and the sequential order on each trial). It seems plausable that any one or a combination of the above problems could account for Geller's finding that decision times were not influenced by the coactor's prediction competence.

The present research extended and refined Geller's paradigm to eliminate the artifacts discussed above. The present study used a reference prediction, R (i.e., the presentation of a stimulus to be considered by subjects prior to making their own predictions) rather than a coactor's vocal presentation. Thus, variant intonations as well as variations in the time available for the subject to make a decision were eliminated. Also, subjects did not pull a particular trigger to make a prediction, but their voice operated a relay which stopped the decision timer. In summary, subjects considered a reference prediction (R) displayed visually on a stimulus panel before making their own predictions. A decision timer started as soon as the R appeared and stopped when the subject verbalized his or her choice.

The present research also extended the competence manipulation introduced by Geller. In particular, competence of the R was varied by altering the instructions as well as the actual prediction outcomes of the R (i.e., 75%, 50%, or 25% correct). In addition, the present study included post-experimental questionnaires designed to evaluate subjects' perceptions of these competence manipulations.

Given the reaction time and decision time research reviewed above, the author proposed the following results concerning each dependent variable. First, it was hypothesized that decision times would vary as a function of the prediction competence of R such that subjects would make faster predictions when agreeing with a 75% correct R than with a 25% correct R. Also, it was expected that subjects would be faster to disagree with an incompetent R (i.e., 25% correct) than with a competent R.

For each prediction competence group, the instruction competence manipulation was expected to influence decision times so that subjects would make faster conforming decisions when they were given high competence instructions concerning a 75% correct R than when given incompetent instructions concerning the same R. Also, subjects were expected to predict faster when given instructions which were congruent with an incompetent R's predictions, such that they would disagree faster when they received incompetent instructions concerning a 25% correct R than when receiving competent instructions. For Group R 50, it was proposed that decisions to conform would be faster for competent than incompetent instructions. Conversely, it was expected that decisions to disagree with R would be faster with the incompetent instructions than with the competent instructions. Further, the author proposed that for each prediction competence group, decision times would be shorter when the subject's preceding prediction outcome was correct rather than incorrect. The later hypothesis was based on similar findings by Geller (in press) and the notion that a correct prediction increases the subject's confidence in their next stimulus prediction as reflected in decision time and reaction time (e.g., Geller, 1974a; Whitman and Geller, 1972; and Kellogg, 1931).

Concerning choice reaction time, it was hypothesized that subject's expectancy would be influenced by the prediction competence of R, R's prediction outcome, the subject's own prediction outcome, and competence instructions. More specifically, it was proposed that the subject's expectancy for a particular stimulus alternative would increase when R predicted that stimulus and was competent (i.e., 75% correct). Conversely, for Group R 25 subjects should expect the stimulus not predicted by R and thus react faster when R was incorrect rather than correct. Also, for each prediction competence group, high competence instructions were hypothesized to increase subjects' expectancy for stimuli predicted by that group and thus decrease RT to stimuli predicted by R, and increase RT to stimuli not predicted by R. Conversely, low competence instructions were hypothesized to increase subjects' expectancy for the alternate stimulus and thus increase RT to stimuli predicted by R and decrease RT to stimuli not predicted by R. In addition, it was proposed that each prediction competence group would exhibit the "prediction outcome effect" cited earlier. That is, subjects would react faster when they correctly predicted the stimulus than when they incorrectly predicted the stimulus.

As a further measure of conformity, the author proposed that the frequency of conforming responses would be influenced by R's prediction competence and competence instructions such that subjects would not only conform more often to a 75% correct R than to a 25% correct R, but for each level of prediction competence the frequency of conforming responses was expected to be greater when subjects were given high competence than when given low competence instructions.

On the post-experimental questionnaire it was hypothesized that subjects' estimates would be influenced both by the prediction competence of R and by competence instructions so that for Prediction Competence Group 75 estimates of R's correctness would be greater than for Prediction Competence Group 25 and within each group high competence instructions would inflate that estimate. It was also expected that subjects would perceive themselves as being more correct (as reflected in subjective estimates) when they conformed to a 75% correct R or remained independent of a 25% correct R than when they considered the predictions of a 50% correct R.

METHOD

Subjects. -- Three groups of twenty subjects each (10 males, 10 females) from the introductory psychology classes at Virginia Polytechnic Institute and State University volunteered for the individual one-hour experimental sessions. The subjects received optional credit for their participation. None of the subjects had prior experience in a reaction time experiment.

Apparatus and Procedure. -- Each subject sat in a chair that faced a pair of reaction triggers (i.e., one for each hand) and a stimulus screen. Instructions given verbally to the subject revealed that the experiment measured prediction ability and reaction time in a situation enabling a consideration of the prediction of others before making personal predictions. In fact, the instructions emphasized that students should consider using the predictions of others when making their own predictions (see Appendix A for complete instructions).

Prior to each subject's stimulus prediction one of two possible symbols $\sqcup$ (labelled up) or $\sqcap$ (labelled down) appeared on the stimulus screen as a reference prediction (*R*), and according to the task instructions represented the most frequent prediction made on that trial by a particular group of students from the previous quarter's introductory psychology class. After considering the reference prediction, the subject verbalized a stimulus prediction (either "up" for $\sqcup$ or "down" for $\sqcap$) into a microphone situated between the two reaction triggers, directly in front of the stimulus screen. Then, following a ready buzzer and a random time interval, one of two stimulus alternatives was presented (i.e., ⊔ or ⊓). The subject identified the stimulus presentation as quickly as possible by pulling a left-hand or right-hand trigger. The stimulus-response mapping relationship was balanced within each experimental condition.

Each of 300 trials consisted of the following order of events; a) the experimenter presented a stimulus (⊔ or ⊓) that indicated to the subject which of the two stimulus alternatives a previous group of students had predicted on that trial, and with this presentation a decision timer started, b) after observing the reference prediction (*R*), the subject made a prediction by verbalizing "up" or "down" into the microphone; with the subject's prediction the *R* was turned off and the decision timer stopped, c) the experimenter presented a .5 second "ready buzzer" that was followed by a random time interval ranging from .5 to 2.0 seconds, d) the 2 X 5 cm. symbol "⊔" or "⊓" was presented on the screen in a position 5 cm. below *R*; with the symbol presentation a choice reaction timer started, e) the subject identified the stimulus presentation by pulling the left- or right-hand trigger as quickly as possible according to the specified mapping instructions and with the subject's reaction the stimulus was turned off and the choice reaction timer stopped. Consequently, on each trial, two response latencies were measured to the nearest millisecond.

Latency Measures. -- Decision time (DT) was the interval occurring between the *R* and the subject's verbal prediction. A digital millisecond timer started when *R* was illuminated and stopped when the subject's verbal prediction operated a voice operated relay. Each subject was told that his predictions were recorded on tape and was asked to voice his predictions clearly, but the subjects were not told that decision latencies were recorded. Choice reaction time (RT) was the interval between the stimulus presentation and the subject's trigger response and was measured with another millisecond timer. The subject was asked to identify the stimulus as quickly and accurately as possible, and was told that choice reaction times were measured.

Prior to each 300 trial session, ten practice trials were given during which the subject's questions concerning the task were answered. Each subject was reminded of his errors whenever one occurred (i.e., a verbal prediction made prior to a presentation of R, a verbalization that was not sufficiently loud enough to operate the voice key, an anticipatory reaction, or an incorrect stimulus identification).

Post-Experimental Questionnaire. -- Following the 300 RT trials each subject filled out a questionnaire to answer the following three questions concerning the task:

1) "What percentage of the trials do you think an 'up' versus a 'down' appeared on your stimulus screen?"

   ______ % UP ______ % DOWN

2) "What percentage of the trials did you think the other students were correct?"

3) "What percentage of the trials did you think your own predictions were correct?"

The subject answered the last two questions by circling one of ten numbers ranging from 10 through 100 (in steps of 10) on a line located beneath each question. After the subject answered the questions, he or she was given the Personal Reaction Inventory (Crown and Marlow, 1964).

Design. -- Each subject received the same series of 300 stimuli, each stimulus alternative occurring on 50% of the trials in each block of 100 trials. For each consecutive block of 50 trials the proportion of "ups" was; .50, .50, .48, .52, .56, and .44 for the last block of 50 trials. Also, inspection of the stimulus list revealed instances in which there were more runs of "ups" than "downs", a run of 6 "ups" in the first trial block, and a run of 8 "ups" from trials 99 through 104. Also, the stimulus sequence for the reference prediction (*R*) was pre-arranged so that each alternative was presented as an *R* prediction equally often.

The *R* presentations were programmed so that the prediction matched the subsequent stimulus on 75% of the trials for one group of 20 subjects, referred to as Group *R* 75. For another 20 subjects the prediction reference matched the subsequent stimulus on 50% of the trials (Group *R* 50); and for Group *R* 25 (N=20) the *R* was correct on only 25% of the trials. Thus, for one experimental condition the reference group was relatively competent (i.e., 75% correct), while the reference group for subjects in Group *R* 25 was incompetent (i.e., 25% correct). The 75:25 and 50:50 prediction outcome distributions were determined by appropriate filtering of a uniform random number generator on an IBM-370 computer with the restrictions that each stimulus alternative was correctly predicted equally often and that prediction outcome probabilities matched the specified probabilities as closely as possible within consecutive blocks of 100 trials. For example, for Group *R* 75, the $\sqcup$ symbol occurred on 50 of the first 100 prediction trials and matched the subsequent stimulus on 37 of the trials. Thus, one between-subjects manipulation of competence was realized by manipulating the probability that R made a correct stimulus prediction.

Ten subjects in each of three prediction competence conditions (i.e., 25%, 50%, and 75% correct R) were instructed that the prediction reference that they were to consider before predicting was the stimulus predicted most frequently on that trial by the eleven best predictors from the previous quarters introductory psychology class. The remaining ten subjects per prediction competence group were instructed that each reference prediction represented the stimulus predicted most often on that particular trial by the eleven worst predictors from the previous quarter. In particular, the portion of the task instructions that referred to the competence of R was as follows:

"On each trial your task will be to predict which stimulus (an up or down) you think is going to appear (the experimenter indicated the location of the stimulus presentation) after observing a prediction which was the most frequently predicted stimulus on that trial made by the eleven (best or worst) student predictors in last quarter's introductory psychology class. Unlike you, those students did not see the predictions of others before making their own predictions."

Thus, a second between-subject competence variable was manipulated with instructions. Consequently, the two between-subject competence variables defined a factorial of 3(Prediction Competence of R; 75%, 50%, or 25% correct) X 2(Instructional Sets; skilled versus unskilled reference group) with five males and five females in each of the six conditions.

RESULTS

Insert Table 1 about here

Stimulus Predictions. -- For each subject the proportion of up predictions was calculated over consecutive blocks of 50 trials. As shown in Table 1, Group R 25 consistently predicted the least proportion of "ups" while the proportion of up predictions for Prediction Competence Group R 75 and R 50 varied over trial blocks. It is noteworthy that trial block means for each group did not vary prominently from .50. The average proportion of up predictions for Group R 75 was .53, .47 for Group R 25, and .52 for Group R 50.

Mean prediction proportions were derived for each condition and studied with an analysis of variance. The 3(Prediction Competence) X 2(Competence Instructions) X 6(Trial Block) factorial indicated a main effect of prediction competence, $F\ (2,54)=9.12$, $p < .01$, and Prediction Competence X Trial Block interaction, $F\ (10,240)=6.80$, $p < .01$. No other main effects nor interactions were reliable, all p's $> .10$.

Conforming Predictions. -- For consecutive blocks of 50 trials the frequency that each subject predicted the same stimulus as (R) was determined. For each subject these frequencies of conforming predictions were converted to proporitons and group averages determined.

Insert Figure 1 about here

Table 1

Proportion of "up" Predictions

PO Probability Group	Consecutive blocks of 50 trials 1	2	3	4	5	6
75% Correct R	53.2	50.4	56.6	50.7	57.3	45.6
50% Correct R	52.3	51.2	50.4	53.1	50.6	51.1
25% Correct R	47.2	48.0	43.8	50.1	43.7	49.1

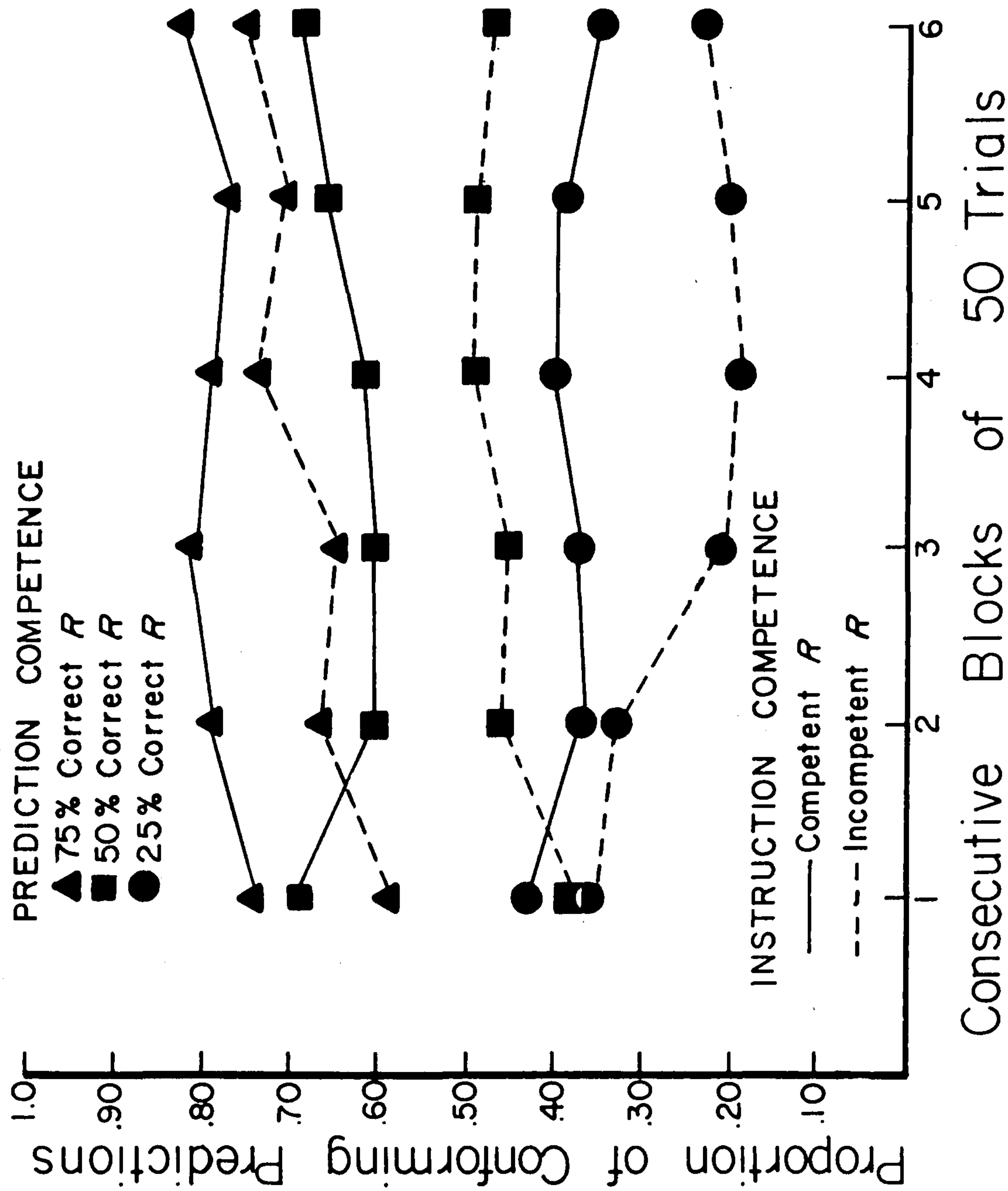

Figure 1. Proportion of conforming predictions as a function of prediction competence, competence instructions, and trial blocks.

As indicated in Figure 1, subject's conforming predictions increased over trials for Prediction Competence Group _R_ 75, but decreased over trials for Prediction Competence Group _R_ 25. Conforming predictions for subjects in Prediction Competence Group _R_ 50 were influenced by competence instructions with the greatest differences occurring in the first and last trial blocks.

The overall analysis of variance, a factorial of 3(Prediction Competence) X 2(Competence Instructions) X 6(Trial Block), revealed main effects of both prediction competence, F (2,54)=39.03 and competence instructions F (1,54)=13.32, $ps < .01$. Two interactions were significant; Prediction Competence X Trial Block, F (10,270)=4.23, $p < .001$ and Prediction Competence X Competence Instructions X Trial Block, F (10,270)= 2.40, $p < .01$.

A separate analysis for each Prediction Competence Group [i.e., 2(Competence Instructions) X 6(Trial Block)] was performed using error estimates from the overall analysis of variance. Only a main effect of trial block was obtained for Groups _R_ 75 and _R_ 25, respectively, F (5,270)=4.06, and F (5,270)=4.1, $ps < .05$. For Group _R_ 50 the analysis revealed only a main effect of instructions, F (1,54)=7.93, $p < .05$.

Subjective Estimates. -- The three questions each subject answered following the task were analyzed separately using analysis of variance for the factorials, 3(Prediction Competence) X 2(Competence Instructions).

Insert Table 2 about here

As Table 2 indicates, for the first question, "What percentage of the trials did you think an "up" as opposed to a "down" appeared on

Table 2

Subjective Estimates on Posttask Questionnaire

Posttask Question	75% Correct R		50% Correct R		25% Correct R	
	Competent Instruct.	Incompetent Instruct.	Competent Instruct.	Incompetent Instruct.	Competent Instruct.	Incompetent Instruct.
"What % of trials do you think an 'up' vs a 'down' appeared on the stimulus screen?"	51.3	57.0	51.0	52.0	45.5	44.5
"What % of the trials do you think the other students were correct?"	73.0	64.0	58.0	49.0	46.0	32.0
"What % of the trials did you think your predictions were correct?"	65.0	55.0	46.0	50.0	52.0	63.0

the screen?", Group R 75 estimated a greater proportion of "ups" than did Groups R 50 and R 25. Group R 25 gave the lowest estimation of "up" occurrences. The analysis revealed only a significant main effect of prediction competence F (2,54)=6.02 $p < .01$. Although reliable, the differences in the mean proportion of "up" estimations between prediction competence groups were low (i.e., 45% for Group R 25, 52% for Group R 50 and 54% for Group R 75).

Data from the second post-experimental question, "What proportion of trials did you think the other students were correct?", revealed that Group R 75 estimated that R was correct 69% of the trials, while the mean estimates for Groups R 50 and R 25 were 54% and 39% respectively. Table 2 also illustrates that within each prediction competence group, subjects were influenced by the instructions they received. Specifically, for each prediction group, subjects who received high competence instructions estimated that the prediction reference was correct more often than did subjects who received low competence instructions. The mean estimates of success for R were 59% for subjects receiving high competence instructions and 45% for subjects receiving low competence instructions.

A 3(Prediction Competence) X 2(Competence Instructions) analysis of variance revealed main effects of prediction competence, F (2,54)=17.94 $p < .001$; and competence instructions, F (1,54)=7.04 $p < .001$. The interaction was not significant, $p > .05$.

For the third question, "What percentage of the trials did you think your predictions were correct?", subjects estimated themselves more successful in Groups R 75 and R 25 than in the Group R 50. The analysis demonstrated only a main effect of prediction competence, F (2,54)=3.41, $p < .05$.

Decision Time. -- Decision errors (i.e., inaccurate verbalization of "up" or "down", and latencies less than 100 msec.) were eliminated from the analysis and when combined with the choice reaction errors (i.e., reactions less than 200 msec. and incorrect identifications) did not exceed 15 (i.e., 5%) for any subject.

For consecutive blocks of 100 trials the decision latencies (i.e., time between the R's and the subject's prediction) of each subject were separated into four mutually exclusive categories defined by the outcome of the subject's previous stimulus prediction (incorrect or correct) and the similarity between the R's and the subject's prediction (agree or disagree). Category means were determined for each subject and group averages were calculated.

Insert Figure 2 about here

As shown in Figure 2, subjects in each prediction competence group made consistently faster decisions when they were correct on the preceding trial than when their preceding prediction outcome (PPO) had been incorrect. In addition, only subjects in Group R 75 made markedly faster decisions when agreeing than when disagreeing with R. Subjects in Group R 50 were somewhat faster to agree than disagree with R, while for subjects in Group R 25 there was no difference in times to agree or disagree.

The overall analysis of variance, a factoral 3(Prediction Competence) X 2(Competence Instructions) X 2(Subject's PPO) X 2(Agree/Disagree) X 6(Trial Block) revealed main effects of only PPO, F (1,540)=52.47 and agree/disagree, F (2,54)=20.69, $ps < .001$. Only one interaction was reliable, i.e., Prediction Competence X Agree/Disagree, F (2,54) = 15.84

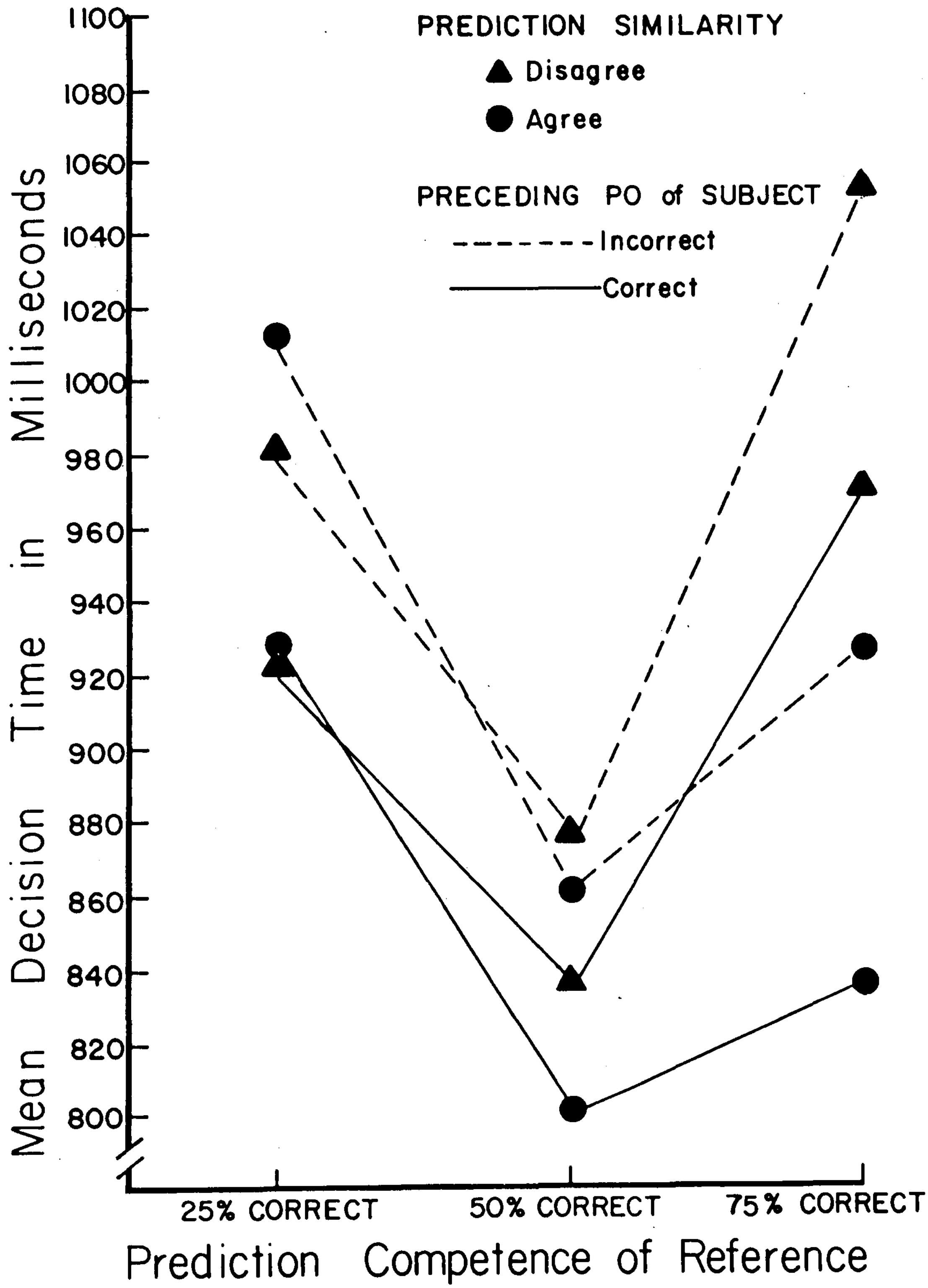

Figure 2. Decision time as a function of prediction competence, PPO of the subject, and similarity between subject's prediction and $\underline{R}$'s prediction.

p<.001. A separate analysis was performed for each prediction competence group, the error terms having been derived from the overall analysis of variance. Each prediction competence group (R 75, R 50, and R 25) revealed a significant main effect of preceding prediction outcome (PPO), all ps< .01. Only Group R 75 revealed a main effect of agree/disagree, p<.001, and no interactions were reliable (all p's >.05).

Reaction Time (RT). -- Choice RT errors (i.e., anticipatory responses less than 200 msec. and inaccurate identifications) were eliminated from the analysis and when combined with decision errors did not exceed 15 (i.e., 5%) for any subject. For each between-subject condition effects of both the subjects prediction outcome (PO) and the PO of R on choice RT were studied by; a) classifying each RT into one of four categories defined by the PO of the subject and the R (i.e., both subject and R incorrect, subject incorrect and R correct, subject correct and R incorrect, and both subject and R correct), b) deriving the group average for each category, and c) calculating the category means for each subject

Insert Figure 3 about here

across 300 trials. As depicted in Figure 3, subjects reacted markedly faster to correctly predicted stimuli than to incorrectly predicted stimuli; and when incorrect, subjects were influenced by both the prediction outcome of R and the prediction competence of R. The overall analysis of variance, a factorial of 3(Prediction Competence) X 2(Competence Instructions) X 2(Subject Prediction Outcomes) X 2(R-Prediction Outcomes) X 6(Trial Block) showed only a main effect of subject-PO, F (1,54)=179.11 p<.001. Only two interactions were significant, R-PO X Prediction

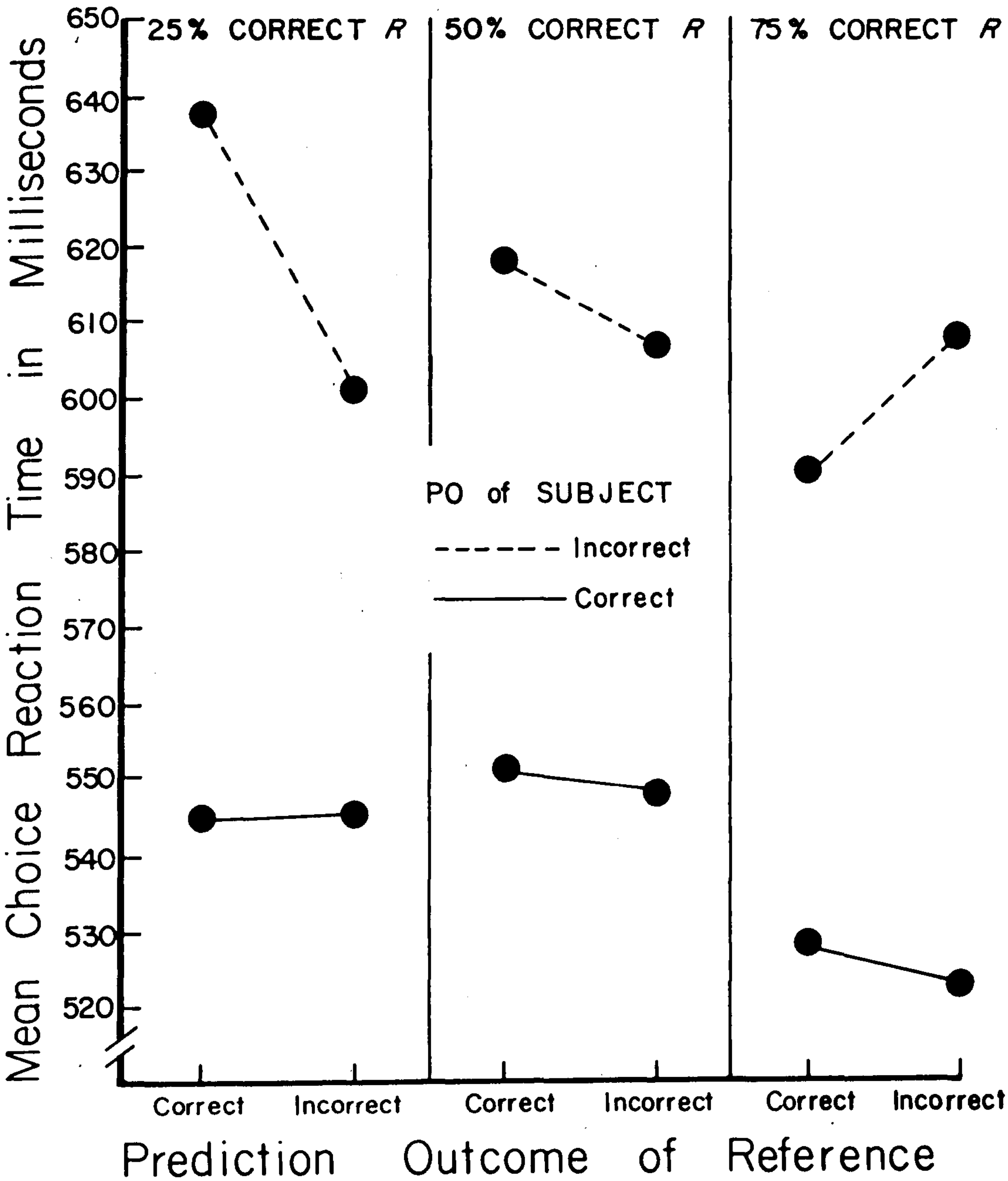

Figure 3. Reaction time as a function of PO of the subject, the PO of R, and prediction competence.

Competence, F (2,54)=4.03 and R-PO X Subject PO X Prediction Competence, F (2,54)=4.28, both ps$<$ .05.

A separate analysis was performed for the correct and incorrect subject-PO categories using error estimates from the overall analysis of variance. When the subject was correct there were no significant RT differences due to prediction competence. The analysis for incorrectly predicted stimuli revealed no main effects, but the R-PO X Prediction Competence interaction was reliable, F (2,54)=7.09, $p<.01$.

A comparison of means using a simple effects test (Newman and Kuels) (Winer, 1962) when the subjects of Prediction Competence Groups R 75 and R 25 were incorrect revealed significant differences between reaction times for R correct and incorrect (Group R 75, $p<.01$ df=54; Group R 25, p$<$ .01 df=54). This comparison between means for R incorrect and correct when the subject was incorrect reached the .05 level of significance for Group R 50. Thus, given an incorrect prediction, subjects in Group R 75 reacted significantly faster when R's prediction was correct than incorrect, but subjects in Prediction Competence Group R 25 and R 50 reacted significantly faster when R was incorrect rather than correct.

Sex of the subject was included as a variable in the overall analysis of variance for each dependent variable, i.e., 2(Sex of subject) X 3(Prediction Competence) X 2(Competence Instructions). There was never a significant main effect of the sex of the subject. Furthermore, the sex variable did not interact significantly with any other variables p's$>.05$. Thus, the sex variable did not influence decision time, reaction time, nor proportion of conforming responses.

In analyzing the need for approval data, subjects were rank ordered in groups of 10 within each prediction competence group according to their need approval (NA) scores. The analysis of variance constituted a 2(Hi-Lo NA) x 2(Prediction Competence) X 2(Competence Instructions) factorial for each dependent variable. Analysis for each dependent measure revealed no main effect of NA. Further, the NA variable did not interact with any other variable.

DISCUSSION

Contrary to results reported by Geller (in press), the present study found that decision latencies to agree and disagree with a reference prediction varied according to the prediction competence of R, as manipulated by the percentage of correct predictions by R. That is, subjects in Group R 75 predicted significantly faster when agreeing with R than when disagreeing with R. Although decision latencies for Groups R 50 and R 25 showed no significant differences between latencies to agree versus disagree, there was a trend for Group R 50 to be faster when agreeing than when disagreeing with the reference prediction.

Worell (1962, 1964) found that subjects took longer to make decisions in a high conflict situation (i.e., a visual discrimination task using very similar stimuli) than in a low conflict situation (a visual discrimination task using very dissimilar stimuli). These results may be considered to explain differences in subjects' latencies to agree and disagree with the R. That is, subjects in Group R 75 were in greater conflict when they disagreed than when they agreed with R and thus took longer to make a disagreeing than an agreeing decision. Moreover, subjects in Group R 50 experienced some conflict when disagreeing since the R was relatively competent (i.e., correct on 50% of the trials). However, since they were in less conflict than Group R 75, they showed less differences in times to agree and disagree. On the other hand, subjects in Group R 25 perceived the R as incompetent (as reflected in subjective estimates) and thus should have experienced more conflict when agreeing than when disagreeing with R. However, the results did not support this notion for Group R 25. Apparently disagreeing normally produces more conflict than agreeing (as supported by Geller's findings) and therefore an incompetent R was not enough to reverse this principle and produce more conflict in agreeing than disagreeing, but instead such a manipulation was capable of neutralizing the conforming tendency as reflected by the absence of decision time differences for Prediction Competence Group R 25.

It is noteworthy that decision latencies were not sensitive to competence instructions. It seems reasonable that since prediction competence was a continuous manipulation that occurred throughout the task, trial to trial variations in the R's competence would influence subjects' decision times. However, since instructions were given prior to the task, subjects were possibly not as sensitive to that competence manipulation as reflected in decision latencies. It seems that decision time as a dependent variable is sensitive to some manipulations (i.e., prediction competence of R and PPO of the subject) but not to others (i.e., competence instructions).

The finding that each prediction competence group was faster when the prediction on the preceding trial was correct rather than incorrect is consistent with Geller's results which he explained by assuming that subject's decision confidence, on a particular trial, was greater when the previous prediction was correct rather than incorrect, and that decision latency was an inverse function of decision confidence. This interpretation was based on research demonstrating a positive correlation between subjects' confidence estimates and a) the speed of opinion revision in a decision making task (Geller and Pitz, 1968), b) speed to discriminate stimuli in a perceptual recognition task (Kellogg, 1931) and c) reaction speeds in a choice RT task (Geller and Whitman, 1973).

For each prediction competence group subjects reacted significantly faster to a stimulus when they had correctly predicted that stimulus than when their prediction was incorrect. The effect of prediction outcome on choice RT has been reported by several other investigators (e.g., Bernstein and Reese, 1965; Geller and Pitz, 1970; Geller, Tuso, and Wellington, 1975; Keele, 1969) and is based on the notion that subjects predict expected events and reaction latencies vary inversely with the degree of the subject's stimulus expectancy for an event.

Effects of R's PO, and prediction competence on subjects reaction time demonstrated not only that a subject's expectancy for an event (as measured by choice RT) may vary as a function of the expectancies (i.e., predictions) of other individuals, but also that such expectancies may be quite sensitive to the competence of a reference-decision maker.

Geller (in press) demonstrated the prediction outcome effect (i.e., for each competence group, subjects' reacted faster to a correct prediction outcome (PO) than to an incorrect PO). He also showed that the effects of another person's PO influenced subjects differently so that for Group 70 (70% correct coactor) RT was faster when the coactor's PO was correct rather than incorrect, but subjects in Group 30 reacted faster when the coactor's PO was incorrect rather than correct

The current study also demonstrated effects of R's PO and prediction competence on subjects' expectancy as reflected in choice RT, but only when the subject made an incorrect stimulus prediction. That is, when the stimulus had been correctly predicted by the subject, RT did not vary reliably as a function of the prediction strategy of R. However, when the subject made an incorrect prediction, the results were consistent with Geller's results and supported expectancy theory. For Group R 75, subjects reacted faster when R was correct rather than incorrect; while for Group R 25 and R 50 subjects reacted faster when R was incorrect rather than correct. According to an expectancy notion, subjects in Group R 75 expected the R to be correct since R was competent, so confirmation of R's prediction resulted in shorter RT's than when R was incorrect. Also, expectancy notions may be used to interpret the shorter RT's when R was incorrect than correct for Group R 25. That is, subjects perceived R as incompetent and thus expected the stimulus that R did not predict, and therefore were faster than when R's prediction was correct.

Recently, Geller (1975) proposed that the effect of PO on choice RT was due to facilitation following correct predictions and inhibition following incorrect predictions. This notion was based on earlier research (Hinrichs & Craft, 1974; Geller, 1974; Geller & Pitz, 1970; Geller & Whitman, 1973; Geller, Whitman & Farris, 1972) which revealed that subjects may not merely be set or unset for a stimulus, but for each state the subject's readiness may vary along a continuous expectancy dimension. Thus, based on data supporting a 2 process theory of expectancy (c.f., Geller, 1975) it seems that some variable may influence only the "set" state (i.e., when the subject is prepared for the stimulus presentation) while other variables influence only the "unset" state (i.e., when the subject is not prepared for the presented stimulus) That is, when the subject is correct (i.e., set for the stimulus) reaction time facilitation occurs, but when the subject is incorrect (i.e., unset for the stimulus) reaction time inhibition occurs. However, facilitation and inhibition function separately as a function of different variables. Thus, Geller (1975) reported that for correct stimulus predictions facilitation varies according to the PPO of the subject, the PO probability and the subject's prediction confidence. However, he did not find reactions to nonpredicted stimuli (i.e., inhibition) to be influenced by these variables Conversely, the presented study showed that another variable, the competence of a reference did influence inhibition (i.e., when subjects were unset due to incorrect predictions), but did not influence facilitation (i.e., when subjects were set).

Both manipulations of the _R_'s competence influenced subjects' prediction strategies. That is, the finding that subjects' conforming predictions increased over trials for Prediction Competence Group _R_ 75 and decreased over trials for Group _R_ 25 showed that subjects' prediction strategies were influenced by _R_'s competence (i.e., eventually conforming more to a competent _R_ than to an incompetent _R_). It is interesting that for Group _R_ 50 conforming predictions were markedly influenced by competence instructions. It seems reasonable to assume that since Group _R_ 50 received no information depicting _R_ as either incompetent or competent via the prediction competence of _R_, that they relied on the instructions throughout the experiment. Group 50 thus conformed more to an _R_ that had been described as competent than to an _R_ that was depicted as incompetent.

As reviewed herein, the frequency of conforming predictions have traditionally been the most widely used measure of conformity. While the present paradigm is methodologically different from conformity paradigms that have manipulated competence in a conformity paradigm, it is interesting that the results presented here support and extend the finding of those studies. For example, with the successive two stage experiments (i.e., Wiesenthal, Endler, Coward and Edwards, 1974; Ettinger et al., 1971) results showed that the greater the perceived competence of the subject, the less conformity demonstrated (i.e., the frequency of conforming was less) and that the perceived competence of the subject with relation to the group was an important variable for consideration. The present study demonstrated not only that subjects would conform more often to a competent reference group than an incompetent reference group, but also that this competence manipulation may be perceived by subjects continuously within the same task so that they eventually conform more to a competent reference group, or become increasingly more independent of an incompetent reference group over trials. Further, the results presented here also show that perceived competence may be manipulated through instructions and that subjects who are dependent only on instructions will use that information in their prediction strategies. Thus, both competence manipulations (i.e., Prediction Competence and Competent Instructions) influence conformity.

In the Geller (in press) study, subjects conformed less to an incompetent coactor and more to a competent coactor. However, the competence manipulation in the present study influenced subjects conforming predictions to a greater extent than in the Geller study. It seems reasonable to assume that subjects in the present study were more influenced with regard to conformity predictions by the predictions of a reference prediction than were subjects who considered a coactor's prediction before making their own predictions.

The subjective estimates obtained from the post-task inquiry were used merely as a check on the experimental manipulation. Prediction Competence Group R 25 estimated the lowest proportions of "ups" while Group R 75 estimated a greater proportion of "ups". This finding seems appropriate since Group R 25 also predicted a lower proportion of "ups" than did Groups R 75 and R 50.

Results from the second post-experimental question "What proportion of trials did you think the other students were correct?" revealed that the subjects were appropriately aware of the levels of competence as manipulated by both instructions and prediction competence. The mean estimate for Group R 75 subjects receiving competent instructions was .73, and .64 for subjects receiving incompetent instructions. Group R 50 estimated R's correctness at .58 for competent instructions and .49 for incompetent instructions. Estimates for Group R 25 were .46 and .32 for competent and incompetent instructions respectively. Thus, the instructional manipulation was effective in changing the subject's perception of R's competence as reflected by subjective estimates as well as by variations in conformity. However, the instructional manipulation of competence was not a significant determinant of subjects reaction latencies or decision times.

Subjects also estimated themselves more successful in Groups R 75 and R 25 than in Group R 50. The actual percent of correct predictions for each group was 62% for Group R 75; 50% for Group R 50; and 61% for Group R 25. The estimated success for each Group was .60 for Group R 75, .48 for Group R 50; and .58 for Group R 25. Since the competence instructions had no effect on subjects' estimates of their own success, these estimates reflected the subjects' ability to correctly perceive their actual correctness when influenced by a reference group.

SUMMARY AND CONCLUSIONS

The paradigm used in this study was useful in manipulating competence via instructions and through prediction outcome of a reference group (R). However, these competence manipulations had differential effects on three dependent variables.

The traditional measure of conformity, the proportion of conforming responses, was influenced by both instructions and the prediction competence of R such that subjects considering a 75% correct R conformed more over trial blocks, while subjects who considered an incompetent R (i.e., 25% correct) conformed less over trial blocks. Also, for each prediction competence group subjects conformed more when given instructions depicting R as being incompetent rather than competent. These results support traditional findings that subjects conform more when they perceive the reference group as relatively competent rather than incompetent.

Decision latencies were not influenced by competence instructions, but were influenced by the prediction competence of R and the preceding prediction outcome of the subject. A conflict notion was used to explain the results that subjects were faster to agree than disagree with a 75% correct R, such that when disagreeing with competent R subjects experienced more conflict than when agreeing and thus took longer to make a decision. The finding that subjects predicted faster when they were correct in predicting the preceding stimulus than when they were incorrect was explained with a confidence construct. That is, subjects were more confident in a given prediction when their previous prediction had been correct and thus took less time to make such decisions.

Although reaction latencies were not influenced by instructions, they were influenced by the prediction outcome of the subject such that subjects reacted faster to correctly predicted events than to incorrectly predicted events. This finding has been termed the "prediction outcome effect" and has been reported in many studies cited herein. Also, reaction latencies were influenced by the interaction of the prediction competence of the R and R's prediction outcome, but only when the subject was incorrect. A 2 process theory of expectancy was used to explain these results. That is, the prediction competence of R influenced subjects when they were inhibited (unset for the stimulus), but not when they were facilitated (set for the stimulus).

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APPENDIX A

INSTRUCTIONS

This is an experiment concerning a college student's ability to predict and identify simple sequential events, in this case the appearance of one of two possible stimuli on the screen in front of you. The two possible stimuli which might appear on each trial are an up stimulus (a U shaped symbol) or a down stimulus (an inverted U shaped symbol).

Also, we're interested in your prediction ability; after you are given the opportunity to consider the decisions made by other students in this task. The degree to which a person can effectively utilize the decisions of others when making decisions varies from individual to individual. Some students can utilize the decisions of other students more effectively.

On each trial your task will be to predict which stimulus (an up or down) you think is going to appear (show location of appearance) after observing a prediction which was:

(A) [Hi Expertise] -- the most frequently predicted stimulus on that trial made by the 11 <u>best</u> student predictors in last quarter's intro psych class.

(B) [Lo Expertise] -- the most frequently predicted stimulus on that trial made by the 11 <u>worst</u> student predictors in last quarter's intro psych class out of 120 students who were in this experiment.

Unlike you, these students did not see the predictions of others before making their own predictions.

After considering the average prediction of the 11 (best)(worst) students you will verbalize your prediction into the microphone as an <u>UP</u> or <u>DOWN</u>. The microphone is sensitive, so please say your predictions clearly so we can record your predictions on tape. After you have done this, a stimulus will appear in the lower rectangle, and your task is to identify the stimulus as quickly as possible by pulling the:

(A) left trigger for an up and the right trigger for a down
(B) right trigger for an up and the left trigger for a down

As well as your prediction ability, we're interested in your reaction time. React as quickly as you can but make a correct identification as often as possible.
[Repeat Mapping]

This prediction and reaction time experiment is exactly like the one run last quarter, except that you may consider the average prediction on each trial made by

a) the 11 best predictors of last quarter's students who ran in this experiment,
b) the 11 worst predictors of last quarter's students who ran in this experiment

The stimulus sequence you will receive was preprogrammed on this paper tape (show) and is the same sequence used with last quarter's intro class.

Let's review the task.

On each trial

1) First you will consider the most frequently predicted stimulus predicted on that trial by the (A) 11 best student predictors
(B) 11 worst student predictors
from last quarter.

2) Then you will say your prediction (UP or DOWN) clearly into the microphone.

3) After you make your prediction, the stimulus will appear in the lower rectangle. You will identify it by pulling the
   (A) left trigger for an up and the right trigger for a down
   (B) right trigger for an up and left trigger for a down as quickly as possible.

4) The cycle will be repeated on the next trial starting with the other students' predictions.

5) Now we'll try some practice trials.

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RESPONSE LATENCIES IN A SOCIAL CONFORMITY

PARADIGM; EFFECTS OF A REFERENT'S COMPETENCE

by

John C. Farris

(ABSTRACT)

On each of 300 trials of a social conformity paradigm, subjects predicted which of two stimuli ($\sqcup$ or $\sqcap$) would appear on a stimulus screen following consideration of a reference group's prediction. The stimulus (either an $\sqcup$ or $\sqcap$) then appeared and subjects identified the stimulus as quickly as possible by pulling a particular reaction trigger. In addition to the typical measure of conformity (the proportion of conforming predictions), two latencies were measured: the interval between the reference prediction and the subject's verbal prediction (decision time), and the interval between the stimulus presentation and the subject's identification response (choice reaction time). Competence of the reference group was manipulated in two ways: by instructions that depicted the reference group as a either competent predictor or incompetent predictor, and by the percentage of correct predictions made by the reference group (i.e., 75%, 50%, or 25% correct).

Both competence manipulations influenced the proportion of conforming responses such that subjects conformed more often to a 75% correct reference than to a 50% or 25% correct reference and subjects' conforming proportions were inflated when they had been instructed (prior to the task) that the reference was competent.

Decision latencies were not influenced by the instructional manipulation of competence. However, subjects' decision latencies were shorter when the subject had been correct rather than incorrect in a preceding prediction. These results were explained using confidence notions. Also, subjects were faster to conform than disagree with a competent reference prediction. Conflict theory was used to interpret those results.

Reaction times were not influenced by the instructional manipulation of competence. However, reaction latencies were influenced by the prediction outcome of the subject, the references prediction competence, and the prediction outcome of the reference group in directions supporting a two process theory of expectancy.