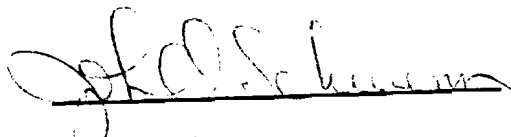CHANGES IN THE OVERCONFIDENCE EFFECT

AFTER DEBIASING

A Thesis

Presented to

the Division of Psychology and Special Education

EMPORIA STATE UNIVERSITY
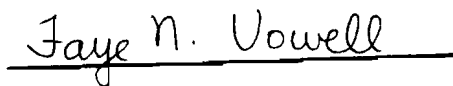

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Erin Sundbye

December 1993

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Chair of Psychology and

Special Education

Faye Vowell

Dean of Graduate Studies

AN ABSTRACT OF THE THESIS OF

Erin Sundbye for the Master of Science degree in Industrial
Psychology presented on December 15, 1993.

Title: CHANGES IN THE OVERCONFIDENCE EFFECT AFTER DEBIASING

Abstract approved: _Michael R_____

The problem of the overconfidence bias is investigated.
The possible reduction of students' overconfidence in
their own predictions was investigated using two debiasing
techniques: exposure to base rate and description of
the problem. It was found that base rate exposure
significantly reduced overconfidence while description
of the problem had no effect. These findings are valuable
for industry. Decisions regarding personnel selection
and delegation of responsibility, for example, would
be better made if the tendency to be overconfident is
diminished by the use of base rate information. Costly
mistakes can then be avoided.

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CHAPTER 1

INTRODUCTION

A growing body of research in contemporary social
and cognitive psychology has been devoted to the processes
whereby people form their judgments and the subsequent
confidence they have in them (Mayseless & Kruglanski,
1987). Much of this research has indicated that people
are typically overconfident in their judgments, regardless
of contradicting information (Arkes, Christensen, Lai,
& Blumer, 1987). It has been demonstrated time and again
that people ignore relevant information and remain confident
in unrealistic assertions. For example, a person who
states his or her answers to several questions have a
80% chance of being correct will usually find that less
than 80% of the answers are actually correct. This is
an example of poor calibration. A perfectly calibrated
individual expresses confidence appropriate to his or
her level of accuracy (Arkes et al., 1987).

Research in probabilistic reasoning has indicated
that people often seem oblivious to certain kinds of
information that play major roles in normative models
of inference, most notably sample size, base rates, and
other predictive validity information (Fischhoff &
Bar-Hillel, 1984). A person who is poorly calibrated
due to a serious overconfidence tendency may disregard
such information due to a sense that superior performance
is being attained without the need for predictive

information.

It has been demonstrated that in making predictions and judgments under conditions of uncertainty, people do not follow the calculus of chance or the statistical theory of prediction (Kahneman & Tversky, 1973). Kahneman and Tversky state that these intuitive predictions are based entirely upon judgmental heuristics. Instead of relying on chance or statistical theory of prediction, people rely on a limited number of heuristics that sometimes lead to reasonable judgments, and other times lead to error. This is because there are factors (base rates and situation specifics such as weather, for example) which affect the statistical likelihood of outcomes, but not the heuristics used for intuitive prediction. As a result of these cognitive heuristics, people predict the outcome that appears most representative of face value evidence. Consequently, intuitive predictions are insensitive to the reliability of the evidence and to the prior probability of the outcome (Kahneman & Tversky, 1973).

It has also been asserted that people are overconfident in their predictions because of a tendency to justify their chosen answer (Koriat, Lichtenstein, & Fischhoff, 1980). In doing so, individuals selectively focus on evidence supporting their belief, while downplaying the importance of evidence which is unsupportive (Koriat et al., 1980). One such factor which may be neglected

is the base rate. A base rate is the incidence, or
percentage of the event, found in a specific population.
For example, a base rate for success that would be helpful
to consider while interviewing a candidate for a job
would be the percentage of currently successful persons
who have graduated from the same school that the candidate
has. If a low percentage of students have not succeeded
or do not hold challenging positions with good firms,
then it would be wise to take this into account. Predictions
which go against relevant base rates yield very low accuracy
and often result in significant overconfidence (Vallone,
Griffin, Lin, & Ross, 1990).

The existence of overconfidence has important
implications for organizational behavior. Overconfidence
in one's prediction of the abilities of another may lead
to a lack of needed supervision or guidance, ineffective
reward systems, and a lack of effective communication.
Within most organizations, people usually do not obtain
all of the relevant information before making a judgment
or decision. This is true even when the information is
potentially available. Time and energy limitations in
the work world demand that people use their intuition
when making judgments. Therefore, intuitive judgment
in decision making plays a large role in the work world
(Einhorn & Hogarth, 1981). This leads to the act of
estimating relevant probabilities of events and in turn
opens one up to many possible biases, including

overconfidence (Block & Harper, 1991).

In social prediction studies, subjects have consistently been overconfident. In five studies with overlapping designs and intent, subjects predicted a specific peer's responses to a variety of situations and were consistently overconfident in those predictions (Dunning, Griffin, Milojkovic & Ross, 1990). This indicates, among other things, a danger of managers overestimating accuracy of their predictions of the behavior of subordinates.

Ronis and Yates (1987) have indicated overconfidence is more pronounced with estimations of the accuracy of general-knowledge answers than with estimations of the outcome of an uncertain event. The prediction of uncertain events is the focus of the present study. Since most important organizational decisions are of this nature, it would be beneficial to determine ways to reduce overconfidence in this context as much as possible.

The overconfidence effect in the work world can be illustrated by considering the job interview. An employer may hire an applicant based on the strength of one characteristic, such as outstanding grades in college. However, this same employer may disregard other important characteristics the applicant may lack, such as adequate interpersonal skills or experience working with others. In this case, the employer is overconfident in the prediction of the applicant's ability because he or she

has focused on the strength of one characteristic (grades) and has not taken into account other equally important areas to do the job well (Griffin & Tversky, 1992). In other words, confidence may be determined by the balance of arguments for and against competing hypotheses, with insufficient regard to the weight of each piece of evidence. When people focus on the strength of their impression with insufficient appreciation of weight, then, the pattern of overconfidence will be observed.

The overconfidence effect appears to be relatively stable and difficult to eliminate. Fischoff (1982) reviewed several research attempts to eliminate overconfidence, including giving rewards, clarifying instructions, warning subjects in advance about the problem, and varying response modes. He concluded that manipulations had proven largely ineffective.

Recent research has yielded more promising results. There is evidence that if subjects are required to produce a point estimate first and then adjust their estimation around this anchor, overconfidence decreases (Block & Harper, 1991). Also, if subjects anticipate having to justify their answers to a group, confidence levels drop (Arkes et al, 1987). It has further been indicated that if a subject is informed about the problem of overconfidence, the effect will decrease, though it will not be eliminated (Block & Harper, 1991). The same is often true of exposure to base rate (Gigerenzer, Hell,

& Blank, 1988). If a situation calls for a high level
of accuracy in one's prediction, it may be most practical
to use more than one debiasing technique. Thus, the chance
of overconfidence occurring will be minimized.

Although there are many issues surrounding the
overconfidence phenomena, the present paper will concentrate
on two specific debiasing techniques: the presentation
of base rates and the presentation of information about
overconfidence in a non-threatening way. In this study,
it is hypothesized that subjects' confidence level in
their prediction will decrease after being exposed to
either debiasing technique. It is further asserted that
two or more techniques used jointly may be most effective
in reducing overconfidence. Although little research
has been done on the effectiveness of debriefing, it
has been demonstrated subjects do take into account relevant
base rates more often than not, resulting in less
overconfidence (Vallone et al., 1990).

Hypothesis one: Subjects exposed to base rate
information will have a larger decrease in confidence
level from the first to the second prediction than subjects
not exposed to base rate information.

Hypothesis two: Subjects exposed to overconfidence
information will have a larger decrease in confidence
level from the first to the second prediction than subjects
not exposed to overconfidence information.

Hypothesis three: Subjects exposed to both base

rate information and overconfidence information will
have the largest decrease in confidence level from the
first to the second prediction.

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CHAPTER II

METHOD

Subjects

One hundred and fifteen students (42 male and 73

female) attending a small midwestern university served

as voluntary participants. Subjects were given the materials

to complete during class time and were given extra credit

for participating. Subjects were treated in accordance

with the "Ethical Principles of Psychologists" (American

Psychological Association, 1981).

Materials

Subjects were presented with standard instructions

(see Appendix A). Two descriptions of managerial applicants

(Appendixes B and C) were used with approximately the

same number of words. Candidates were described according

to age, education, temperament, (ie., "innovative",

"dominant") and professional experience. Subjects were

instructed to predict level of success for each and then

to rate level of confidence in their own predictions.

For subjects in two of the experimental groups,

a theoretical base rate was provided (see Appendixes

D and E). The base rate information given was percentage

of graduates from the second candidate's class who go

on to successful careers. The given base rate was low,

and it was explained this was due to poor faculty at

the candidate's college.

For subjects in two of the experimental groups,

information on the overconfidence effect was given along with reasons to eliminate it (see Appendixes E and F). This information stated that overconfidence is a human tendency that in no way reflects intelligence, but that there are advantages to eliminating it. An example was given to illustrate this point. Subjects were instructed to imagine a nurse feeling overconfident that a patient is receiving enough medication, when in fact the patient is not. It is then stated the consequences of overconfidence can literally be a matter of life or death.

Procedure

Subjects were divided into four groups. Before being presented with test materials, all subjects were given instructions, presented in Appendix A, by the experimenter. After answering questions, the experimenter gave each subject the test materials. Upon completion, the experimenter collected all test materials and thanked each group for contributing to the study.

The control group was presented with two candidate descriptions and then asked to predict success for each candidate, followed by a rating of confidence in each prediction. For all groups, the first prediction served as a baseline from which to judge changes between the first and second confidence levels. In experimental group one, after predicting success level for the second candidate, subjects were presented with overconfidence information before being asked to rate confidence in

their second prediction. In experimental group two, after predicting success for the second candidate, subjects were presented with a base rate before being asked to rate confidence in their second prediction. In the third experimental group, subjects were presented with both base rate and information on overconfidence prior to rating confidence in their second prediction.

After subjects were instructed to predict success for each managerial candidate, they were then asked to estimate confidence in their own predictions according to a percentage scale of 1% to 100%. Before presentation of the second description, subjects in the third experimental group were warned of the problem of overconfidence and given base rates of managerial success within the applicant pool. Subjects given overconfidence information were told it is natural to want to be correct, but that it can be very beneficial to oneself and to others if realistic confidence levels in one's predictions can be generated. It was also stated that false confidence in one's predictions in no way reflects level of intelligence. Finally, an example was provided that illustrated the dangers of overconfidence in the medical field.

Experimental Design

The independent variables were the presentation of base rate information and the presentation of overconfidence, both of which had two levels, and the

two dependent variables were prediction of success and
confidence level. Because there was no difference between
control and experimental groups for the first measure,
the statistical procedure used was ANOVA, with two
variables. Each contained two levels: presentation of
the information or lack of presentation of the information.

CHAPTER III

RESULTS

A series of 2 X 2 (base rate information by overconfidence effect information) ANOVAs were used to test the hypotheses. The first pair of analyses examined the degree to which groups differed in their responses to the first decision. With respect to subjects' predictions of the candidate's success, there was a main effect for base rate information ($F(1,110)=5.185$, $p=.025$). Subjects who were given base rate information rated the candidate as more likely to succeed (M=6.56) than subjects who were not to be given base rate information (M=5.88). With respect to subjects' confidence in their predictions, there were no significant main effects or interactions indicating subjects in all groups were equally likely to exhibit the overconfidence effect.

The second pair of analyses examined the degree to which experimental groups differed in their responses to the second decision. With respect to subjects' predictions of success, there were no significant main effects or interactions. However, the analyses examining subjects' confidence in their predictions indicated a main effect for base rate information ($F(1,110)=5.421$, $p=.022$). Subjects who received base rate information were less confident (M=67.94) than subjects who did not receive base rate information (M=78.25). This result supports hypothesis one, which argued base rate

information should decrease the magnitude of the overconfidence effect. There was no main effect for overconfidence information ($F(1,110)=.200$, $p=.655$). Subjects given overconfidence information and subjects given no overconfidence information were equally confident of their predictions of success, failing to support hypothesis two, which stated those given overconfidence information would be less confident of their predictions.

CHAPTER IV

DISCUSSION

The primary distinctions in the results are between
those who were presented with base rates, those who were
presented with information on overconfidence, and those
who were presented with both. It is clear the results
support hypothesis one that stated exposure to base rates
does decrease the magnitude of the overconfidence tendency.
There was no main effect for overconfidence information
and none for interaction of overconfidence information
and base rate. As a result, hypotheses two and three
were not supported. It may be that overconfidence, by
its nature, is not affected by warnings. Subjects may
have assumed that although overconfidence is a problem,
they as individuals are not prone to it, thus being
overconfident they are exceptions to the rule. In any
event, this finding agrees with past research that has
shown warnings concerning the overconfidence effect have
little or no effect (Fishhoff, 1982).

In addition, it was found that subjects who were
given the base rate information were more likely to rate
the first candidate as more likely to succeed than were
other subjects. Although this may have some significance,
data from this study is insufficient for examination
of this finding. In looking at confidence levels in
predictions prior to manipulation, results indicate subjects
in all groups were equally likely to exhibit

the overconfidence effect for the first condition.

For psychologists interested in performance judgments, these results have important implications. Taking into consideration the fact that introduction of base rates lowers overconfidence, psychologists can help clients be more accurate and realistic when estimating their own current and future performance levels. Base rates may contribute to increasing effective behavior by introducing realistic goals since they may help clients realize their standards for their own behavior are unrealistic when compared to actual or estimated base rates. For example, a workaholic who believes he or she is not performing well can be shown base rates of those with the same job. These base rates can include average number of hours worked per week, average number of projects completed within a month, and average number of hours spent with family and friends per week. This information may be very instrumental in helping such a client form a more realistic opinion of his or her performance level, which in turn may help lead to a decrease in workaholic behavior.

Past performance can also be more accurately evaluated when base rates are available, thereby helping clients gain more realistic ideas about themselves and their potential. It is very common for those who have sought therapy to judge their own past performances and behavior negatively, so much so that their viewpoints may be highly

unrealistic. If individuals can be shown specific base rates that contradict their unrealistic expectations, they may become more accepting of their past and, hopefully, of themselves. For example, a student who believes his or her past school performance was poor could be shown a GPA base rate of students similar to themselves. Examples of these may be students who have gone through stressful experiences (for example, a death in the family or an alcohol problem), those with a learning disability, or the overall average campus GPA. If such a client can be shown that judgments of his or her own past performances are unrealistically harsh, more accurate and less stressful beliefs concerning these past performances can be formed.

In addition, the results of this study have important implications for those whose jobs involve making decisions and who take responsibility for their own judgments. There has recently been substantial development of sophisticated information processing aid through the use of computers and improved analytical techniques involved in decision making. Probability assessments are widely available due to sophisticated statistical techniques. Operations involving corporate and other industrial planning can therefore utilize probability assessments to derive either base rate estimations or actual base rates. Confidence level in predictions can then be estimated more accurately, and overconfidence in one's own predictions can be avoided more effectively.

As a consequence, practical implications are potentially unlimited. Training in the use of base rates can help prevent poor decisions that are costly to the organization; potential resources affected include both human and financial. For instance, decisions concerning personnel can be improved, reducing the number of decisions resulting in bad fit between job and individual. This better fit would in turn lower training costs. Employees whose predictions are financially important (for example, decisions involving whether to expand a department) and which may have impact on others, then, may be urged to consider base rates (or estimations of) when making such decisions. Methods used to obtain base rates can be included in training programs or can be used by specialists. If decision makers systematically consider base rates during the decision making process and when estimating accuracy of their own predictions, costly mistakes can be avoided.

This particular study should be repeated in different industrial areas to determine if these results can be replicated. Since so many differences between college and industry populations exist, generalization to industry should not be assumed. The subjects in the present study were fairly homogeneous in relation to age, geographic area, and course of study, and it is clear that such groups are not representative of industry.

However, overconfidence research such as this can certainly be further expanded within this subject pool.

For example, base rate exposure can be examined in terms of differences between genders. Confidence in one's decisions has long been rewarded for males more than for females, and it would be interesting to look at differences in both overconfidence levels and reaction to base rate exposure. Also, the effectiveness of base rate exposure can be compared with other possible methods of reducing the overconfidence tendency, such as testing only those who have a certain level of expertise with the material under consideration.

Another possible area of study within this subject pool concerns whether risk level has an effect on the overconfidence tendency. In this study, and unlike most decision makers in industry, subjects were aware their ratings would have no adverse impact on them personally; in fact, they were given extra credit for contributing to the study. If subjects were informed they would be personally penalized if they were overconfident in their predictions (for example, if overconfident they would not receive the extra credits for participating), they may be less apt to show this tendency.

It has been determined, in light of this and other studies, that people are insufficiently critical of their inference processes. The validity of inference processes is often not questioned, and the process is usually accompanied by a feeling of certainty of being correct. Overconfidence in one's predictions is potentially costly

both financially and within the realm of personnel.
Therefore, it is in industry's best interest to address
this tendency, and to focus on ways to decrease it.

This study has supported the assertion that exposure
to base rates may influence the process of overconfidence
and encourages people to add new information when
determining confidence level in their own predictions.
Other future research should focus on whether base rates
lower overconfidence within industry and whether
investigations in multiple types of industries would
be most helpful.

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APPENDIX A

Below are the instructions presented to all groups.

"This material will be used to complete a Master's thesis. Participation is voluntary, and would be very much appreciated. Please complete one page at a time. As you complete each, turn them over on your desk. When you are done, I will collect them from you. Are there any questions?"

Appendix B

The first managerial description, below, was presented
to all groups. For the experimental groups, ratings given
for level of success prediction and confidence in this
prediction were used as a baseline for which to compare
ratings given for the second candidate, after manipulation
had taken place. For the control group, the second
description was given immediately after this one to assure
that variances were due to manipulation.

Below is a description of an applicant for a managerial
position at a local McDonald's restaurant. After considering
the information provided, predict what you believe would
be the level of success achieved by the applicant if
hired.

1.

Mr. Jones is a 26-year-old high school graduate
with two years of college completed. He is intelligent
and innovative, but prefers working alone to working
with others. He does not mind directing and leading others
but dislikes confrontations. He is generally well liked
by people around him but very dominant people tend to
take advantage of his good nature. He is determined to
do a good job if hired and is open to suggestion on how
to improve his performance.

Based on a scale of one to ten, with one being the lowest and ten the highest level of success, I predict that this applicant, if hired, would achieve the following level of success:

Next, please rate your confidence in your own prediction from a scale of 1% to 100%:

APPENDIX C

Below is the candidate description given to obtain the second group of data, after manipulation had taken place, or in the case of the control group, it was given immediately after the first.

Mr. Anderson is a 27-year-old college graduate with a degree in business. He is intelligent, domineering and dedicated to getting the job done. He has little patience for others' excuses for being late or absent. He has internship experience as a manager at a local convenience store, and although the people who worked under him did not particularly like him, the store he worked in ran smoothly.

Based on a scale of one to ten, with one being the lowest and ten the highest level of success, I predict that this applicant, if hired, would achieve the following level of success:

(Note: this next line will be on this page when presented to the control group, but will be on a third page given to all three experimental groups. Only pages one and two will be presented to the control group.)

Next, please rate your confidence in your own prediction from a scale of 1% to 100%:

APPENDIX D

Below is the base rate information given to the second experimental group, prior to rating confidence level in prediction of success for the second candidate.

Imagine now being presented with the information that there is a very low base rate of people who will go on to have successful careers within Mr. Anderson's graduating class. This means that due to very poor faculty, only 15% will go on to be successful in their first job after graduating.

As before, please rate your confidence in your own prediction for Mr. Anderson's success, from a scale of 1% to 100%:

APPENDIX E

Below is the information presented to the experimental group exposed to both overconfidence and base rate information. This information was presented prior to rating confidence level in the second prediction.

It may be interesting for you to know that overconfidence in one's predictions is a well documented human tendency. Its presence is in no way an indication of low intelligence or other undesirable characteristic; it is simply a human tendency. Although it may be positive in that it helps people to increase their confidence, there are potential problems involved. For example, consider a doctor or nurse who may feel overconfident that a patient is receiving appropriate medication. In this case, the consequence of overconfidence is literally a matter of life or death.

Imagine now being presented with the information that there is a very low base rate of people who will go on to have successful careers within Mr. Anderson's graduating class. This means that due to poor faculty, only 15% will go on to be successful in their first job after graduating.

As before, please rate your confidence in your own prediction for Mr. Anderson's success, from a scale of 1% to 100%:

APPENDIX F

Below is the overconfidence information presented
to the first experimental group prior to rating confidence
level in prediction of the second candidate's success.

It may be interesting for you to know that
overconfidence in one's predictions is a well documented
human tendency. Its presence is in no way an indication
of low intelligence or other undesirable characteristic;
it is simply a human tendency. Although it may be positive
in that it helps people to increase their confidence,
there are potential problems involved. For example, consider
a doctor or nurse who may feel overconfident that a patient
is receiving appropriate medication. In this case, the
consequence of overconfidence is literally a matter of
life or death.

As before, please rate your confidence in your own
prediction of Mr. Anderson's success:

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Changes In The Overconfidence
Effect After Debiasing

Title of Thesis

Signature of Graduate
Office Staff Member

Date Received