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Neglecting the Predictions of Others: The Effects of Base Rate Neglect and Interhemispheric Interaction on the Above and Below Average Effects

by

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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Psychology

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An Abstract of

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Can the above- and below-average effects be debiased by providing people with base rate information? Two experiments were designed to investigate the debiasing effects of providing numerical and verbal base rate information on the above- and below-average effects (Kruger, 1999). In Experiment 1, participants answered easy and hard trivia questions taken from Lanning (2011) and made absolute and comparative judgments of ability. The results of Experiment 1 showed that providing numerical base rate information was able to debias the below-average effect, but had no effect on the above-average effect. In Experiment 2, participants made absolute and comparative judgments of ability on easy and hard tasks, taken from Rose et al. (2012). The results from Experiment 2 showed that providing verbal base rate information was unable to debias the above- or below-average effects. Results from Experiment 2 also showed that egocentric weighting was reduced after being presented with verbal base rate information, but only in consistent handers, as predicted.
To my mom and grandma, you have inspired me with all of your love and faith. I Love you mom and grandma. You are missed dearly, grandma.
Acknowledgments

This thesis and my graduate education would not be possible without the love and undying support from my mother and to the inspiration and guidance I have received from my mentor, Dr. Stephen Christman. I remember telling my mother at 6 years old that I wanted a medical degree and a Ph.D. I spent much of my early education focusing on biology and chemistry and then I took my first psychology class and realized that I also wanted a degree in psychology because of its importance to the medical field and my life. I came to realize after taking a class with Dr. Christman that I found my true calling and reaffirmed that realization during the many hours of conversation I had outside of class with Dr. Christman. I should have known that my academic future was in psychology considering most of my childhood I spent watching a physically and mentally abusive relationship take place in front of me. So with the experience of my childhood and the understanding of how important and mysterious the mind is I finished my bachelor’s degrees in biology and psychology with my sights set on psychology for graduate school, which I applied to my undergraduate alma mater the University of Toledo.

I will never repay the debt of gratitude that I have to Dr. Christman and the other professors, like Dr. Alice Skeens, that have given such invaluable guidance, but I will try my best to utilize all of the guidance towards the further understanding of the mind and how it makes us who we are.
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List of Abbreviations

ToM………………………..Theory of Mind

EHI………………………..Edinburgh Handedness Inventory
Chapter One

Social Comparisons Biases: General Description and Overview

Are you above, below, or just average? What information do you use to answer that question? Even if we are not asked those questions directly, people still try to make comparisons to figure out where they fit among others. To complete this task accurately is easier said than done. Comparisons between the self and others can range from athletic ability, height, weight, attractiveness, intelligence, financial status, etc. Many of the comparisons that can be made are done so without any objective scale or any information about the average on that same task/activity. Many times the only information that is available about others is self-generated predictions of others. Two of the social comparison biases that have been found are the above and below average effects. These effects, as will be described in further detail below, occur when a participant ranks one’s self as being above average (e.g. >50 percentile) or below average (e.g. <50 percentile) on easy or hard tasks, respectively (Kruger, 1999). Why do these biases occur? This question is not easily answered and has received much attention in the study of social comparisons.

When participating in a social comparison experiment, subjects are asked to compare their ability or performance with that of the average/typical student. Kruger (1999) reported that when absolute skills tend to be high (i.e. using a computer mouse or riding a bicycle), the majority of people rate themselves as above average (e.g. >50 percentile), whereas when absolute skills tend to be low, a below average effect is shown (e.g. <50 percentile). The inaccuracies in social comparisons have been documented throughout many experiments (Burson, Larrick, & Klayman, 2006; Ehrlinger, Johnson,

The comparisons made by subjects in a social comparison experiment are both absolute and relative. The absolute judgment involves participants being asked how skilled they are at a certain task. They must then estimate how skilled is the typical other. Participants have estimated absolute skill of the self and the typical student on a Likert type scale (Kruger, 1999), how many trivia questions the self and others would answer correctly (Rose, Jasper, & Corser, 2012), or how many trivia questions the self and others actually answered correctly (Lanning, 2011). The relative comparison is made by asking subjects to estimate their overall percentile rank. As described above, when people estimate their percentile rank on easy tasks, an above average effect is shown and, when they estimate their percentile rank on hard tasks, a below average effect is shown. It is mathematically impossible for the majority of people to be above or below average on any given task, and these biases in percentile estimates have been interpreted in terms of egocentric biases. Egocentrism manifests as the overweighting of predicted self-performance and the underweighting of the typical student’s predicted performance. Specifically, Kruger (1999) supported the egocentrism explanation through a regression analysis. In this analysis, the absolute self-estimation of ability/performance and the absolute estimation of the typical student’s performance were entered as predictors of the
estimated percentile rank. The analysis revealed the significant predictor of percentile rank was the estimate of absolute skill for the self.

Kruger (1999) briefly discusses the idea that information about the self is more accessible than information about others and could be a factor in comparative estimates of skill. Burson, Larrick, and Klayman (2006) furthered that idea by suggesting the above and below average effects occur due to “noise plus bias”. The “noise” they describe is due to lack of knowledge about others, as Kruger (1999) briefly discusses. The “bias” portion is a function of the difficulty of the task, with comparisons on hard tasks biased towards below average (<50.0 percentile) and easy tasks biased towards above average (>50.0 percentile). Logically people would be more egocentric in their comparative judgments because more information is known about the self than that of others. The “noise”, as described by Burson et al. (2006), has been further supported by Moore and Small (2007). They reported that, when accurate feedback on self-performance was given, the biases increase, whereas when feedback about others was given, the biases are attenuated. Their manipulation allowed for the self or others to become more salient, depending on feedback condition.

In addition to the above, there have been other studies that find reductions in the above and below average effects in social comparisons under certain conditions, such as manipulating the target, typically the self, and the referent, typically the average person or group, of the comparison (Krizan & Suls, 2008). Specifically, they found that whether the self was the target or the referent, the target received more focus and the typical social comparison bias was observed. Kruger et al. (2008) found similar reductions in egocentric biases by increasing how familiar the target and referent are to the participant.
Taken together, this suggests that egocentrism may not be solely responsible for biases in social comparisons.

The effect of “noise” on the above and below average effects has not been thoroughly investigated. Expanding on this concept, if people had objective information about others on which to base their comparative rankings, then it could be predicted that participants will not be as biased as reported in the past. If the information about others, typically self-generated, is accurate and not incorporated into relative rankings, then it may appear that people are being egocentric in their comparisons. It could be that participants generate biased predictions about others, which if incorporated would bias their comparisons with others and appear egocentric. Participants have made accurate predictions about the performance of others on easy and hard trivia (Lanning, 2011). Despite being accurate about the performances of others, participants still showed the above and below average effects. Rose, Jasper, and Corser (2012), reported that participants provide ratings of others’ absolute skill that reflected the relative difficulty of the task (e.g. above 5 on easy tasks and below 5 on hard tasks). Just because there is inherent noise in predicting the behaviors and skills of others does not mean that people are not accurate at times. Regardless of the accuracy of predicting information about others, the information does not appear to be accurately weighted. The information being neglected is base rate information.

The primary goal of this dissertation is to show that providing base rate information will debias the above- and below-average effects and reduce the amount of egocentrism shown in these biases. In the following sections, base rate neglect will be defined and the effect it has on social comparisons will be discussed.
Chapter Two

Base Rate Neglect and the Above and Below Average Effects

How does a person truly know if they are above or below average? If a person had accurate, objective information about others, then a non-biased comparison could be made. Information about others can be viewed as a source of base rate information. Base rate information can be viewed in the context of social comparisons, as the percentage of people that engage in an activity or the percentage of people who are truly good or poor at a given activity. People who do not take this information into account when making comparative rankings will likely be biased in their comparisons with others. Researchers have suggested that people favor representative information over base rate information (Kahneman & Tversky, 1973; Tversky & Kahneman, 1974). For example, if the participant viewed his score as representative of an above average person, he may neglect the predictions about others, regardless of accuracy, and rank the self above average.

As described above, participants in a social comparison experiment provide predictions of absolute skill or performance on a task for both the self and others, and then estimate the ranking of the self-relative to others on that same task. Researchers have asked participants to estimate skill on easy and hard tasks (Kruger, 1999), and number of trivia questions the self and others would or have answered correctly (Lanning, 2011; Rose et al, 2012). In all three studies, college students were used as participants. If a participant understands that the questions or tasks are overtly easy or hard for the self and others, then their estimations of how others perform should be accurate. For example, Lanning (2011) reported that participants in the easy condition estimated others would answer 14.9 questions correctly, out of 20, and the actual mean
number of questions answered correctly was 14.2. Participants estimated others’ performance accurately and this level of accuracy has been observed in predicting helping behavior rates of others (Epley & Dunning, 2000). This suggests that people have the ability to be accurate about the performance and behavior of others, but fail to use this information accurately when comparing to the self. Prior research by Rose et al. (2012) and Lanning (2011) supports the finding that people do not use information about others accurately when estimating percentile rank.

Base rates are constructed conceptually by people going through life witnessing others engage in an activity (i.e. mouse usage, juggling, or answering trivia questions) or being informed of how well and how many people perform an activity. For example, if you ask a person to rate one’s self on a percentile rank on mouse usage, as Kruger (1999) did, you will likely receive a response well above 50th percentile. After which, if you ask a person to estimate what percentage of people they know or have met use a mouse, then you will likely get an answer somewhere between 80 to 100 percent. This suggests that, even though they predict the vast majority of people use a mouse they still inaccurately rank the self as above average. If a person were to incorporate base rate information in their estimates of percentile rank, then the regression analysis that Kruger (1999) conducted may have yielded two significant predictors, the self and others. It may be that egocentrism is driving the above and below average effects and because of egocentric processes people are neglecting base rate information. From this if people were attending to base rate information egocentrism may be reduced as well as the above- and below-average effects.
The primary purpose of this dissertation is to show that both the above- and below-average effects and egocentrism can be reduced by providing participants with information about base rate. If people were provided with base rate information then they would be better calibrated and show less bias. In the next section, the discussion will return to previous findings of individual differences in the above and below average effects based on degree of handedness, including the hypotheses and conclusions from Rose et al (2012) and Lanning (2011). The secondary purpose of this dissertation is to further investigate differences in the above and below average effects based on degree of handedness.
Chapter Three

Degree of Handedness and the Above- and Below-Average effects

Previous research has suggested, people show the above and below average effects due to egocentrism. Egocentrism in social comparisons manifests, statistically, as an imbalance in the judgment weight given to predictions of the self and others, with more weight given to predictions of the self. The regression analysis from Kruger (1999) showed that the best predictor of percentile rank was the absolute predictions of skill of the self. Rose et al. (2012) and Lanning (2011) investigated the egocentrism explanation of the above and below average effects using degree of handedness as an individual differences variable. Before making the connection between egocentrism and degree of handedness, degree of handedness must be discussed.

The vast majority of modern research that has been conducted in the field of psychology has ignored degree of handedness as an individual differences variable. The research in the past has only focused on direction of handedness (i.e., left- versus right handed). Direction of handedness has been argued to be not as important as degree of handedness (Christman, Propper, & Brown, 2006; Christman, Propper, & Dion, 2004; Propper & Christman, 2004; Propper, Christman, & Phaneuf, 2005) and the number of published articles addressing degree of handedness is increasing. Degree of handedness is based on subjects’ self-reported hand preference on a variety of tasks (e.g. writing, throwing, brushing teeth). A consistent hander refers to a person who prefers the use of one hand across all tasks, whereas an inconsistent hander is a person who prefers the use of their non-dominant hand for at least one task.
The corpus callosum is the bundle of nerve fibers that provides the largest connection between the left and right cerebral hemispheres. The corpus callosum enables interhemispheric interaction, allowing the processes of the left and right hemispheres to be integrated. A significant relationship has been found between corpus callosum size and strength of handedness, finding in general that degree of handedness has a negative relationship with corpus callosum size. Wittelson and Goldsmith (1991) found, in a sample of all males right handed for writing, a negative correlation \( r = -0.67 \) between degree of right-handedness and corpus callosum size. Cowell, Kertez, and Denenberg (1993) support Goldsmith (1991) in finding that strongly right handed males had smaller collasa sizes than weakly right handed males. Other research has found a similar relationship between degree of handedness and collosa size (Clarke & Zaidel, 1994; Habib et al., 1991).

In a recent study by Luders et al. (2010), they directly investigated the relationship between degree and direction of handedness and corpus callosum size. They measured strength of handedness using the Edinburgh Handedness Inventory (EHI; Oldfield, 1973) and used MRIs to measure corpus callosum size. They showed that there are significant differences in the size of the corpus callosum based on the degree of lateralization of hand preference. Specifically, three areas of the corpus callosum were significantly larger in less lateralized handedness groups regardless of direction; two of the areas being associated with the connection between motor cortices of the left and right hemisphere and one section being associated with connections between the prefrontal cortices of the left and right hemisphere. This provides an important
connection between degree of handedness, corpus callosum size, and the greater amount of interhemispheric interaction that may be associated with inconsistent handers.

Researchers have investigated the idea that being inconsistent handed would result in having relatively greater access to right hemisphere processes than being consistent handed. For processes believed to be dependent on access to right hemisphere processes, strength of handedness has been a significant individual differences variable. The Hemispheric Encoding Retrieval Asymmetry (HERA) model (Tulving et al., 1994) argues that episodic memories are encoded versus retrieved by the left versus right hemispheres, respectively. Thus, it can be hypothesized that having greater access to episodic memory retrieval mechanisms of the right hemisphere would result in having a superior episodic memory. Christman and others have found that inconsistent handers, relative to consistent handers, have a superior episodic memory (Christman, Propper, & Brown, 2006; Christman, Propper, & Dion, 2004; Lyle, Logan, & Roediger, 2008; Lyle, McCabe, Roediger, 2008; Propper & Christman, 2004; Propper, Christman, & Phaneuf, 2005). The superior episodic memory of inconsistent handers is believed to be due to greater access to right hemisphere processes mediated by a larger corpus callosum.

Although, the research cited above establishing a relationship between strength of handedness and access to right hemisphere processes, it does not directly deal with egocentrism as the research by Rose, Jasper, and Corser (2012) and Lanning (2011) does. Both of the above studies found that inconsistent handedness was associated with lesser degrees of egocentrism in the above and below average effects. Specifically, in Experiment 1 of Rose et al. (2012), they had participants compare the skill of the self on easy (e.g. computer mouse usage) and hard tasks with their classmates (peers). In
Experiment 2, they asked participants to predict how many questions the self and others would answer correctly on both easy and hard categories of trivia questions. Participants only estimated hypothetically how many they would get correct if they were asked those categories of questions. Results revealed that consistent handers showed the above and below average effects to a greater degree than inconsistent handers across both experiments. They also showed there was a differential weighting of information about the self and others, as predicted with consistent handers showing greater egocentric weighting compared to inconsistent handers. If consistent handers show larger comparative biases and more egocentrism in their rankings on hypothetical performance of tasks and answering trivia questions, does it extend to actual performance based estimations of rank?

Lanning (2011) provided an answer to the above question and strengthened the relationship between degree of handedness and egocentrism. In Experiment 2 of Lanning (2011), participants were asked to answer 20 easy or hard trivia questions and then to make absolute and comparative estimates of performance. By actually answering the trivia questions, participants did not have to think about how they would perform hypothetically, but instead could reflect on their actual performance. The results of the experiment replicated Rose et al. (2012). In the Rose et al. (2012) study, all subjects displayed the usual above- and below-average effects, but these effects were significantly larger in consistent-handers. In the Lanning (2011) study, based on actual performance data, consistent-handers again showed robust above- and below-average effects. In contrast, inconsistent-handers displayed a smaller above-average effect and no below-average effect at all, ranking themselves at the 50.3 percentile for the hard task. From the
studies described above it can be inferred that having greater access to right hemisphere processes reduces egocentrism.

Rose et al. (2012) and Lanning (2011) hypothesized that having greater access to areas of the right hemisphere associated with theory of mind (ToM) reduces egocentrism in inconsistent handers. Having a theory of mind includes the ability to consider the knowledge that others possess, considering other people’s perspectives, infer mental states of others, and being able to incorporate information about others to understand the relative position of the self among others. Researchers investigating theory of mind have found a significant relationship between right hemisphere function and success on these tasks. For example, Weed et al. (2010) found that patients that suffered right hemisphere damage had significant impairment on ToM tasks. Mason et al. (2008) found that autistic patients had excessive activation in the right hemisphere, more so than would be necessary, and the corpus callosum size was also significantly smaller than controls. The diminished size of the corpus callosum is thought to have reduced autistic patients’ ability to complete the ToM task. The reduction in interconnectivity between the left and right hemisphere in autistic patients compared to controls was supported by Lo et al. (2011). Having greater access to theory of mind areas of the right hemisphere could partially explain why relatively greater egocentric weighting in consistent handers was observed by Rose, Jasper, and Corser (2012) and Lanning (2011).

Based on Lanning (2011) and Rose et al. (2012), it could be inferred that consistent handers believe that they are truly above or below average on easy or hard tasks, respectively. However, there could be a more parsimonious explanation. Rose et al. (2012) and Lanning (2011) replicated the regression analysis showing decreased
egocentric weighting in inconsistent compared to consistent handers when estimating percentile rank. It may be that consistent handers are less able to incorporate base rate information leading to greater egocentrism. It could also be said that inconsistent handers show less egocentrism because they are better able to incorporate base rate information. If a consistent hander predicted the absolute performance of the self and the typical student but neglected the predictions about others, then greater egocentrism would be observed. Inconsistent handers may be more likely to spontaneously incorporate base rate information and subsequently weight information about the self and others more equally resulting in reduced egocentrism.
Chapter Four

Social Comparison Biases: Base Rate Neglect and Handedness Predictions

Kahneman and Frederick (2002) suggested that drawing attention to base rate information before predictions are made would reduce base rate neglect. With this in mind, the degree to which a participant shows the above-and below-average effects should be attenuated or more biased, depending on base rate information. It is also predicted that consistent handers, since they show larger biases, will be more affected by base rate information. It may be that having a less accessible ToM leads to greater egocentrism, which in turn leads to base rate neglect. From this idea it could be predicted that providing information about base rate would reduce the above- and below-average effects and egocentrism.

The effect of providing feedback about others has been shown to decrease a social comparison bias analogous to the above and below average effects (Rose & Windschitl, 2012). They had participants engage in multiple rounds of a throwing competition in which both participants could see the performance of the other. Participants were asked to estimate self-score, the score of their competitor, and the likelihood that they would win the next round of competition. The feedback about the other’s performance came from witnessing the other person throw objects across multiple rounds. This is similar to the explicit feedback that participants received in Experiment 1 of this dissertation. They showed that this form of feedback reduced the difference in likelihood of winning estimates between easy and hard to throw objects. This shows that participants realized that the difficulty of the task affected both competitors and adjusted
accordingly. In addition, they also showed that self-estimates and estimates of their competitor were more highly correlated as rounds progressed, thus reducing egocentrism.

Researchers in the area of social comparison have not found effects of individual differences on the above and below average effects (Chambers & Windschitl, 2004). However, research on strength of handedness has shown that relatively greater access to right hemisphere processes reduces comparative biases and egocentrism in the above and below average effects (Lanning, 2011; Rose, Jasper, & Corser, 2012). Inconsistent handers may show less bias and less egocentrism when they make social comparisons, but what could be occurring is they are better able to incorporate information about others when they make rankings of the self-relative to others. Researchers have found that inconsistent handers are better able to take another person’s perspective and thus show lesser degrees of the endowment effect (Sontam, Christman, & Jasper, 2007), which supports an inconsistent hander advantage when thinking about and incorporating others’ performances. In addition, the right hemisphere has a tendency towards inclusion and global processing (Forster, Liberman, & Kuschel, 2008), which involves taking multiple pieces of information and adding them together to form a cohesive whole.

Forster, Liberman, and Kuschel (2008) also describe the right hemisphere as having a broader perceptual and conceptual scope, whereas the left hemisphere is associated with a more narrow scope of attention. When making a comparative estimate, a person must attend to multiple pieces of information and reflect that information in the estimate of percentile rank. A clear hypothesis from the above can be made; having greater access to right hemisphere processes, as inconsistent handers are hypothesized to have, will allow base rate information to be incorporated into information about the self.
and from that accurate estimates of percentile rank can be made. Simply stated greater access to right hemisphere better enables information to be attended to and weighted more equally.

To investigate the effects of base rate neglect and degree of handedness in social comparison biases, two experiments were conducted. The first experiment investigated the effect of numerical base rate information given to participants prior to making percentile ranks, after they have made estimations of absolute performance of the self and the typical student. The base rate information provided to participants was taken from Lanning (2011). Three levels of numerical information were provided to participants. Each level had different predicted effects on percentile estimates. The accurate base rate information (50th percentile) was predicted to reduce the above average effect in the easy task and the below average effect in the hard task. A biased base rate was presented that made the tasks seem harder than it actually are (75th percentile) was predicted to increase the below-average effect in the hard task and reduce the below-average effect in the easy task. A biased base rate that made the tasks seem easier than they actually are (25th percentile) was predicted to increase the above-average effect in the easy task and reduce the below-average effect in the hard task. In addition, it was hypothesized that consistent and inconsistent handers would not differ in the effect numerical base rate had on their percentile estimates. This would suggest that with the inclusion of numerical base rate information the differences in the above- and below-average effects would not be present compared to Lanning (2011).

In Experiment 2, instead of giving numerical base rate information more abstract verbal information will be given versus a control condition of no base rate information.
Experiment 2 was designed to be an extension of Rose, Jasper, and Corser (2012). Three easy and three hard tasks, taken from Rose et al (2012), were judged by participants. The easy tasks were driving a car, riding a bike, and using a computer mouse and the hard tasks were computer programming, playing chess, and juggling. Experiment 2 differs from Rose et al. (2012) by presenting participants with verbal base rate information prior to making percentile rank estimates across all tasks. The verbal base rate information was adapted from a debiasing prime used by Windschitl et al. (2008). The debiasing prime used by Windschitl et al. (2008) describes a bias that affects the likelihood judgments of winning a competition. It instructs people to think about how they performed and how their competitor performed. One change to the debiasing information pertained to the difficulty others experience when performing these activities. Another change to the procedure of Rose et al. (2012) was participants supplied absolute estimates of skill, for the self and others, on all tasks before making percentile rank estimates on all activities sequentially. The order of presentation of hard and easy activities was counterbalanced. Presentation order was not predicted to have an effect on the estimates of percentile rank based on Kruger (1999) reporting no effects of order.

It was also predicted in this experiment that consistent-handers would be affected more by this information due to the increased bias they show compared to inconsistent-handers in previous studies (Lanning, 2011; Rose, Jasper, & Corser, 2012). Because of this finding the debiasing effect on inconsistent handers would not be as apparent as the effect on consistent handers, since consistent handers show greater levels of egocentrism and larger above- and below-average effects. In other words, consistent and inconsistent handers would not differ nor show the above- or below-average effects in the verbal base
rate condition. The regression analysis was hypothesized to show reduced levels of egocentrism by indicating that the estimated skill of the self and others were significant predictors of percentile rank, regardless of handedness.

If the results of Experiments 1 and 2 are as hypothesized, then researchers reducing the above and below-average effects by manipulating the target and referent would receive more theoretical support. Specifically, making the target of the comparison the average person, a friend, or a group and the making the referent the self or including the self, as in Krizan and Suls (2008). The idea that differences in the accessibility of information about the self and others is what are driving these biases would receive theoretical support. This would mean that information about the self is more accessible therefore is attended to more than information about others. The hypothesized results from Experiments 1 and 2 with the results from Krizan and Suls (2008) would suggest that egocentrism is only a minor contributor to the above and below average effects. Krizan and Suls (2008) found that the target received more focus and subsequently comparisons were biased towards the target, regardless if the target was the self or not. That would also suggest that a major contributor to the above and below average effects would be a failure to properly and accurately attend to and incorporate information about others when making a relative comparison, which could be a result of egocentric processes. This would suggest that one way to reduce egocentric biases is to draw more attention to others and less attention to the self.
Chapter Five

Design and Procedure of Experiment 1

Participants. 194 participants from Introduction to Psychology participated for course credit. Five participants were removed from the following analyses. 3 participants estimated their percentile 3 standard deviations below the mean in the easy condition and 2 participants were removed because of missing data. There were 139 females and 50 males in the final analyses.

Design. The numerical information given to participants, based on data from Lanning (2011), were the 25th, 50th, and 75th percentiles for group performance on the easy and hard trivia tasks. On easy trivia questions the 25th percentile score was 13, the 50th percentile score was 15 and the 75th percentile score was 17. On hard trivia questions the 25th percentile score was 1, the 50th percentile score was 3 and the 75th percentile score was 6. The design of this experiment was a 3 (75.0, 50.0, 25.0 percentile) x 2 (easy/hard trivia) x 2 (consistent/inconsistent handedness) between subjects design.

Materials. Handedness was assessed using the Edinburgh Handedness Inventory which involves self-reporting hand preference for 10 activities (EHI, Oldfield, 1971). Responses on the EHI are “always left”, “sometimes left”, “no preference”, “sometimes right”, and “always right”. The responses are scored as -10, -5, 0, +5, and +10, respectively. The range of scores on the EHI is from -100 to +100.

The median split method was employed to establish handedness groups. The median split of the absolute values of the EHI resulted in a median handedness score of 80, with consistent handers scoring 80 and above. As determined by the median split method, 99 were consistent handers and 90 were inconsistent handers. This method has
been used in numerous strength of handedness studies (Christman, Bentle, & Niebauer, 2007; Christman, Henning, Geers, Propper, & Niebauer, 2008; Jasper, Barry, & Christman, 2008; Lanning, 2011) to dichotomize EHI scores into consistent and inconsistent handers. A copy of the EHI is included in the Appendix A.

The above and below average effects were investigated using the 20 easy and 20 hard trivia questions from Lanning (2011). Refer to Appendix B for a copy of the questions. The manipulation check by Lanning (2011) showed the easy questions were viewed as easy, whereas the hard questions were viewed as being hard. An example of an easy question is “What is the name of a dried grape” and an example of a hard question is “What country was the first to use gunpowder”. The questions were originally derived from a set of 300 normed questions from Nelson and Narens (1982). The questions asking about absolute estimates of performance were “how many questions do you think you answered correctly” and “how many questions do you think, on average, other students answered correctly”. The relative comparison question was “how well do you think you did compared to other students” and the answer was given in a percentile rank (e.g. 0 to 100%).

Procedure. Subjects were run individually or in small groups of no more than 3. Participants were given an informed consent form to sign upon entering the lab. After obtaining consent, the experimenter gave participants the experiment booklet containing all materials. In the first portion of the experiment, participants answered 20 easy or 20 hard trivia questions, depending on condition. Then, participants estimated the absolute performance of the self and typical others. Before making relative comparisons via percentile rank, participants read a short passage providing them with explicit feedback
about the typical student’s performance in the form of numerical base rate information. The information providing the number of correct answers by the typical student was obtained from Lanning (2011). The information provided to participants was the 75th, 50th, or 25th percentile score. Participants read a passage, before providing a percentile rank, stating “We have administered the same set of questions to UT students in an earlier study and found that the typical UT student got 17 (15, 13) out of 20 correct” in the easy condition. In the hard condition the passage stated “We have administered the same set of questions to UT students in an earlier study and found that the typical UT student got 6 (3, 1) out of 20 correct”. All experiment materials are included in Appendix B and should be referred to for exact wording of the manipulation. Participants then filled out the EHI, were debriefed, and dismissed.
Chapter Six

Results of Experiment 1

The task in Experiment 1 was 20 easy or hard trivia questions taken from Nelson and Narens (1980) and used in Lanning (2011). The independent variables were task difficulty, level of feedback, and strength of handedness. The dependent variables included the number of correct responses given by the participant, the participant’s estimate of the number of correct responses by the average student, and the participant’s relative percentile rank estimate. The design of this experiment was 2 (easy/hard questions) X 3 (75th, 50th, 25th percentile scores) X 2 (consistent/inconsistent handers). There were no effects of gender to report, which is consistent with Lanning (2011); therefore gender was collapsed across all conditions.

Some of the analyses described below do not include the independent variable of feedback. Participants estimated self-performance and the performance of the typical student before receiving feedback, therefore the independent variable of feedback was not included. The first analysis was conducted on the number of questions that participants thought they answered correctly out of 20. A 2 (easy/hard) X 2 (consistent/inconsistent handers) ANOVA was conducted and yielded one significant main effect with no interactions. There was a significant effect of difficulty, $F (1, 185) = 546.2, p < .001, d = 3.38$, indicating that participants estimated they correctly answered significantly more easy questions than hard questions. The mean number of questions participants thought they answered correctly in the easy condition was 15.1 and 4.3 in the hard condition. The significant main effect of difficulty was expected and supports a successful manipulation of difficulty. There were no other main effects or interactions.
The actual number of correct responses given by participants to the 20 easy or hard trivia questions was also obtained. A 2 (easy/hard) X 2 (consistent/inconsistent handers) between subjects ANOVA was conducted on the actual number of correct answers. The ANOVA yielded a significant main effect of difficulty, $F(1, 185) = 578.6$, $p < .001$ $d = 3.49$, indicating that participants actually answered significantly more easy questions correctly than hard questions. The mean number of questions answered correctly by participants in the easy condition was 14.6 whereas in the hard condition participants answered 3.5 correctly. The significant difference between participants’ actual performance on easy and hard questions was predicted and further supports that the manipulation of difficulty was effective. There were no other main effects or interactions.

The correlation between actual performance and estimated self-performance was obtained for both easy and hard conditions. For the easy condition, the correlation between self-estimate and actual performance was $r = .883$. For the hard condition, the correlation between self-estimate and actual performance was $r = .791$. Fisher $r$ to $z$ transformation allowed for the two correlation coefficients to be compared. The result showed that there was a significant difference in the accuracy of estimated performance, $z = 2.13$, $p = .033$, with participants in the easy condition being better calibrated. Participants in the easy condition were significantly more accurate about their performance than participants in the hard condition. Refer to Table 1 for self-estimate, actual performance, and the correlation between self and actual performance.
Table 1

*Participants’ Self Estimate, Actual Performance, and Correlations.*

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Self-Estimate (SD)</th>
<th>Actual Performance (SD)</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>15.1 (2.95)</td>
<td>14.6 (3.17)</td>
<td>.883*</td>
</tr>
<tr>
<td>Hard</td>
<td>4.3 (3.41)</td>
<td>3.5 (3.16)</td>
<td>.791*</td>
</tr>
</tbody>
</table>

*Significant

An analysis was conducted on participants’ estimation of the number of correctly answered questions given by the average student. A 2 (easy/hard) X 2 (consistent/inconsistent handers) between subjects ANOVA revealed a significant main effect of difficulty, $F(1, 185) = 92.5, p<.001$ $d =1.40$, indicating participants’ estimations of the average student’s performance were significantly affected by difficulty. The mean number that participants estimated the average student would get correct was 14.2 in the easy condition and 8.1 in the hard condition. This effect was predicted and further supports a successful manipulation of difficulty.

Having both participants’ estimation of others’ performance and actual group performance allows for the relationship between these dependent variables to be investigated. The correlation between participants’ estimation of the performance of the average student and the actual performance in the easy condition was significant, $r = .321$, $p = .001$. The correlation between participants’ estimation of others’ performance and actual performance was not significant for the hard condition, $r = .121$, $p = .248$. This
shows that participants were nominally less certain of the actual performance of others in the hard condition with a mean difference estimated and actual performance of 4.6. Even though these two correlations appear to be different based on their significance in each condition, a statistical test to investigate if they truly are different from each other is warranted. A Fisher r to z test reveals that these two correlation coefficients are not significantly different, \( z = 1.43, p = .15 \). This shows that participants are just as accurate about the performance of others in the easy condition as they are in the hard condition. Refer to Table 2 for means and correlations.

Table 2

*Participants’ Estimate of Other, Actual Performance, and Correlations.*

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Others-Estimate (SD)</th>
<th>Actual Performance (SD)</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>14.2 (2.50)</td>
<td>14.6 (3.17)</td>
<td>.321*</td>
</tr>
<tr>
<td>Hard</td>
<td>8.1 (5.64)</td>
<td>3.5 (3.16)</td>
<td>.121</td>
</tr>
</tbody>
</table>

*Significant

The key analysis involves subjects’ estimation of percentile rank after receiving feedback about others. Unlike the previous analyses, the follow statistical test will include feedback as additional factor with three levels. Participants estimated their percentile rank after reading a passage providing them with explicit numerical feedback about the performance of others from a previous sample.
Participants’ estimation of percentile rank was submitted to a 2 (easy/hard) X 3 (feedback of 75.0, 50.0, 25.0 percentile scores) X 2 (consistent/inconsistent handers) between subjects ANOVA and yielded three significant main effects and a two-way interaction. There was an expected significant main effect of difficulty, $F(1,176) = 42.39, p < .001 \ d = .86$. The mean percentile rank estimation in the easy condition was 76.64 and in the hard condition the mean percentile rank was 52.86. There was a significant main effect of feedback, $F(1,176) = 11.37, p < .001$. The mean percentile rank for the 75\textsuperscript{th} percentile feedback condition was 74.41, the 50\textsuperscript{th} percentile feedback condition was 66.56, and the 25\textsuperscript{th} percentile feedback condition was 53.28. The main effect of strength of handedness was also significant, $F(1, 197) = 5.926, p = .016 \ d = .19$. The mean estimate of percentile rank for inconsistent handers was 69.2 and the mean for consistent handers was 60.3. The difference between inconsistent and consistent handers was not predicted. The three-way interaction was not significant. Refer to Table 4 for means.

The hypothesized interaction between level of feedback and difficulty was significant, $F(1, 176) = 7.07, p = .001 \ \partial\eta^2 = .074$. Refer to Table 3 for means and Figure 1 for graphical representation of the interaction. There was only one level of feedback, the 75\textsuperscript{th} percentile feedback of the hard condition, which produced an estimated percentile rank of less than 50.0, whereas all other levels of feedback produced percentile estimates above 50.0, regardless of difficulty. This shows that the below average effect can be eliminated when participants have objective numerical feedback about the performance of others.
A simple effects analysis was conducted to further investigate the interaction between level of feedback and difficulty. The first simple effects analysis investigated the effect of level of feedback within each difficulty. The simple effects analysis revealed that in the easy condition, the three levels of feedback did not have significantly different effects on percentile rank estimates, \( F(2, 176) = .273, p = .76 \). In the hard condition, the three levels of feedback had significantly different effects on percentile rank, \( F(2, 176) = 17.75, p < .001 \). Specifically, the 25\(^{th}\) percentile feedback produced significantly higher estimated percentile rank (70.46) than the 50\(^{th}\) percentile feedback (55.61) \( (p = .022) \) or the 75\(^{th}\) percentile feedback (32.50) \( (p < .001) \). The 50\(^{th}\) percentile feedback produced significantly higher percentile estimates (55.61) than the 75\(^{th}\) percentile feedback (32.50) \( (p < .001) \). This shows that providing numerical base rate information can significantly affect comparisons between the self and the typical student, but only in the hard condition.

The second simple effects analysis investigated the effect of difficulty within each level of feedback on percentile estimates. The analysis revealed that difficulty did not produce significantly different percentile estimates in the 25.0 percentile feedback condition, \( F(1, 176) = 1.45, p = .231 \), but did in the 50.0 percentile feedback condition, \( F(1, 176) = 12.39, p = .001 \), and the 75.0 percentile feedback condition, \( F(1, 176) = 45.36, p < .001 \). All three levels of feedback in the easy condition produced percentile estimates higher than any level of feedback in the hard condition. As shown above, the 25\(^{th}\) percentile feedback of the hard condition produced percentile estimates not significantly different from the 25\(^{th}\) percentile feedback level of the easy condition. This shows that difficulty only affected percentile ranks in the 50.0 and 75.0 percentile feedback.
conditions. It can also be seen that providing average (50\textsuperscript{th} percentile) to lower than average (25\textsuperscript{th} percentile) feedback about others can debias or reverse the below-average effect.

Table 3

*Participants’ Estimation of Percentile Rank: Difficulty by Level of Feedback*

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Level of Feedback</th>
<th>Percentile Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>25\textsuperscript{th} Percentile</td>
<td>78.38</td>
</tr>
<tr>
<td></td>
<td>50\textsuperscript{th} Percentile</td>
<td>77.51</td>
</tr>
<tr>
<td></td>
<td>75\textsuperscript{th} Percentile</td>
<td>74.05</td>
</tr>
<tr>
<td>Hard</td>
<td>25\textsuperscript{th} Percentile</td>
<td>70.46</td>
</tr>
<tr>
<td></td>
<td>50\textsuperscript{th} Percentile</td>
<td>55.61</td>
</tr>
<tr>
<td></td>
<td>75\textsuperscript{th} Percentile</td>
<td>32.50</td>
</tr>
</tbody>
</table>

Table 4

*Consistent Handers Estimation of Percentile Rank: Difficulty by Level of Feedback*

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Level of Feedback</th>
<th>Percentile Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>25\textsuperscript{th} Percentile</td>
<td>78.00</td>
</tr>
<tr>
<td></td>
<td>50\textsuperscript{th} Percentile</td>
<td>77.89</td>
</tr>
<tr>
<td></td>
<td>75\textsuperscript{th} Percentile</td>
<td>61.37</td>
</tr>
<tr>
<td>Hard</td>
<td>25\textsuperscript{th} Percentile</td>
<td>65.59</td>
</tr>
<tr>
<td></td>
<td>50\textsuperscript{th} Percentile</td>
<td>51.92</td>
</tr>
<tr>
<td></td>
<td>75\textsuperscript{th} Percentile</td>
<td>27.07</td>
</tr>
</tbody>
</table>
Table 5

*Inconsistent Handers Estimation of Percentile Rank: Difficulty by Level of Feedback*

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Level of Feedback</th>
<th>Percentile Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>25&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>78.75</td>
</tr>
<tr>
<td></td>
<td>50&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>77.14</td>
</tr>
<tr>
<td></td>
<td>75&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>86.73</td>
</tr>
<tr>
<td>Hard</td>
<td>25&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>75.33</td>
</tr>
<tr>
<td></td>
<td>50&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>59.30</td>
</tr>
<tr>
<td></td>
<td>75&lt;sup&gt;th&lt;/sup&gt; Percentile</td>
<td>37.94</td>
</tr>
</tbody>
</table>

*Figure 1.* Participants’ Estimation of Percentile Rank: Feedback by Difficulty

Error bars: +/- 1 SE
As a requirement of the above- versus below-average effects, percentile estimates must be significantly above the 50.0 percentile versus below the 50.0 percentile, respectively. A series of one sample t-tests were conducted on percentile estimates comparing each level of feedback across both levels of difficulty with a test value of 50.0. In the easy condition, all three levels of feedback produced percentile estimates significantly higher than 50.0 (all ts >5, ps <.001). This indicates that all levels of feedback in the easy condition resulted in an above average effect. In the hard condition, the 75th percentile feedback condition resulted in a percentile estimate that was significantly lower than 50.0, t (30) = -3.08, p = .004. The 50th percentile feedback condition in the hard condition resulted in percentile estimates that were not significantly different than 50, t (32) = 1.13, p = .268, indicating that no below average effect was observed. The 25th percentile feedback condition in the hard condition resulted in percentile estimates significantly higher than 50.0, t (28) = 5.15, p < .001, indicating that instead of a below average effect being observed, an above average effect was observed. This shows that explicit feedback in the hard condition had the ability to increase, eliminate, and reverse the below average effect.
Discussion

This experiment was designed to investigate the effects of providing explicit feedback in the form of numerical base rate information on the above and below average effects. This experiment was also designed to provide evidence that base rate neglect is a potential explanation for the above and below average effects. The hypotheses for this experiment were based on the effects of providing different levels of explicit feedback about the performance of others before participants estimated percentile rank. The individual hypotheses for each level of feedback across both difficulties will be discussed separately.

The different levels of explicit feedback given to participants were taken from Lanning (2011) and they were the 75th, 50th, or the 25th percentile scores from both easy and hard trivia questions. It was hypothesized that the providing explicit feedback about the performance of others would increase, decrease, or reverse the above and below average effects, depending on the level of feedback. In the following paragraphs the hypotheses for each difficulty and level of feedback will be discussed separately along with the results that support or do not support them.

In the easy condition, the 75th percentile feedback was hypothesized to reduce and possibly reverse the above average effect to an estimated percentile at or below 50. The 50th percentile feedback was hypothesized to reduce participants’ percentile estimates to a level not significantly different from 50. The 25th percentile feedback was hypothesized to increase participants’ estimated percentile rank thereby increasing the above average effect. The results reveal that providing explicit numerical feedback about others did not significantly affect percentile estimates in the easy task, therefore did not support the
hypotheses stated above. The different levels of feedback in the easy condition were nominally in the hypothesized direction. Specifically, the 25th percentile feedback produced the highest estimated percentile, the 75th percentile feedback produced the lowest estimated percentile, and the 50th percentile feedback resulted in an estimated percentile between the 75th and 50th feedback conditions. The results suggest that participants’ estimation of percentile rank is resistant to feedback in easy tasks, regardless of the level. It may be that participants see their estimated number of correct as representative of a person that is above average, feel more certain about their performance, and therefore ignore feedback about their relative standing.

In the hard condition, the results revealed that level of feedback had significant effects on participants’ estimated percentile rank. The 75th percentile feedback was hypothesized to increase the below average effect resulting in the lowest estimated percentile rank. The 50.0 percentile feedback was hypothesized to result in participants’ percentile rank estimates being not significantly different than 50. The 25th percentile feedback was hypothesized to reduce or possibly reverse the below average effect resulting in percentile estimates above 50. The results support the stated hypotheses in the hard condition. The levels of feedback produced percentile estimates that were significantly different from each other and in the hypothesized direction. The 75th produced percentile estimates significantly below 50 and significantly lower than the 50th and the 25th percentile feedback conditions. The 50th percentile condition resulted in percentile estimates of 55.6, which was nominally above 50 but not significantly different from 50. The 25th percentile feedback condition resulted in percentile estimates significantly higher than 50, as hypothesized. Of note is the fact that the 25th percentile
feedback condition resulted in percentile estimates similar to those in the easy conditions. The 25th percentile feedback successfully reversed the below average effect resulting in an above average effect.

Overall, providing feedback on easy trivia did not have any differential effects on percentile estimates, whereas providing feedback on hard trivia had significant effects. The pattern of these results is supported by Hoch and Loewenstein (1989) and Petrusic and Baranski (1997). They found that providing feedback has differential effects based on difficulty with feedback being more effective in hard conditions. This general finding will be discussed in more detail in the general discussion.

Previous researchers have found that consistent and inconsistent handers show the above and below average effects to different degrees, with consistent handers showing greater degrees of both (Lanning, 2011). Because there was not a control condition (no feedback) in this experiment, a direct statistical comparison with the above study could not be made. Considering a control condition was not included in this experiment, the general hypothesis was that consistent and inconsistent handers would not differ in the degree of above and below average effects due to the inclusion of feedback. It may be that the inclusion of feedback made the differences in the above and below average effects between the handedness groups disappear, even though inconsistent handers gave higher estimates of percentile rank. Implications of the above findings and future directions will be detailed in the General Discussion section.
Chapter Seven

Design and Procedure of Experiment 2

Participants. 123 participants from Introduction to Psychology participated for course credit. One participant was removed from analyses for failure to answer all questions leaving 122 participants remaining in the analyses. There were 102 females and 20 males.

Design. This experiment was designed to investigate the debiasing effects of providing verbal base rate information to participants before making percentile estimates. The materials that were used in this experiment were derived from Rose, Jasper, and Corser (2012) with some modifications. They had their participants make estimates of percentile rank before providing estimates of absolute skill for the self and their classmates (peers). The modification to allow for presentation of verbal base rate information was to have participant estimate absolute skill on each task then estimate percentile rank. The verbal base rate information was provided to participants prior to making percentile rank estimates. The experiment was a 2 (Presentation order: Easy/Hard or Hard/Easy) X 2 (Consistent/Inconsistent Handers) X 2 (Condition: Control/Verbal Debiasing) between-subjects design.

Materials. The three easy (using a computer mouse, driving a car, and riding a bike) and three hard tasks (computer programming, juggling, and playing chess) that were used in this experiment were the same six tasks that were used in Rose, Jasper, and Corser (2012). Rose, Jasper, and Corser (2012) asked participants to provide percentile estimates followed by asking participants to make estimates of absolute skill of the self and their classmates (peers). They asked their participants to make all three estimates one
task at a time. The verbal debiasing information was adapted from Windschitl et al. (2008), which describe a bias in judgment when comparing the self to others. They instruct participants that there are two important things to consider when predicting the likelihood of winning a competition; self-performance and the performance of others. The additions made to the debiasing information included lines describing the relative difficulty that other people have with the tasks that were judged. Specifically, the additions were as follows: “For example, it is easy for most people to drive a car, operate a computer mouse, or ride a bicycle. Similarly, it is hard for most people to program a computer, juggle, or play chess.” Refer to the Appendix C for a copy of the exact debiasing information.

Handedness was assessed using the Edinburgh Handedness Inventory which involves self-reporting hand preference for 10 activities (EHI, Oldfield, 1971). Responses on the EHI are “always left”, “sometimes left”, “no preference”, “sometimes right”, and “always right”. The responses are scored as -10, -5, 0, +5, and +10, respectively. The range of scores on the EHI is from -100 to +100. This was the same procedure as in Experiment 1.

The median split method was used in this experiment. Unlike Experiment 1, the median split of the absolute values of the EHI resulted in a median handedness score of 85, with consistent handers scoring 85 and above. As a result of the median split there were 62 consistent handers and 60 inconsistent handers. A copy of the EHI is included in the Appendix.

Procedure. Participants were run singularly or in small groups of no more than 3. Upon entering the lab, participants were handed an informed consent form to look over
and sign when they were ready to begin the experiment. After consent was given, participants were handed a booklet containing all experimental materials. Half the participants estimated absolute skill, for the self and their peers, on easy tasks then hard tasks, whereas the other half estimated skill on hard tasks then easy tasks. Participants estimated their absolute skill, for both the self and for their classmates (peer), on a 1 to 10 scale (1=very unskilled; 10= very skilled). Following estimations of absolute skill, half of the participants saw a page containing the verbal debiasing information whereas the other half continued to the next portion of the experiment. The next portion of the experiment asked participants to estimate their percentile rank on each of the six tasks on a 0-99 scale (0= I’m at the very bottom; 50= I’m exactly average; 99= I’m at the very top). A copy of all experiment materials is included in Appendix C. Upon providing percentile estimates for all six tasks, participants completed the EHI, were debriefed, and dismissed.
Chapter Eight

Results of Experiment 2

This experiment investigated the effects of base rate on the above and below average effects in the form of verbal information versus numerical information. The verbal information given to participants was designed to increase the amount of attention they gave to the abilities of others on easy and hard tasks. The easy tasks were driving a car, using a computer mouse, and riding a bicycle and the hard tasks were programming a computer, juggling, and playing chess. The experimental materials were taken from Rose, Jasper, and Corser (2012) with the addition of a verbal debiasing manipulation prior to participants making percentile estimates. The independent variables were order of presentation, verbal base rate information, and strength of handedness. The dependent variables were self-rating of ability, rating of others ability, and estimated percentile rank as the key dependent variable. The overall design of this experiment was a 2 (order: easy/hard, hard/easy) X 2 (condition: verbal information/control) X 2 (consistent/inconsistent handers). There were no effects of gender to report; therefore gender was collapsed across all conditions. Refer to Table 6 for absolute estimate means on easy and hard tasks for the self and peers.

The primary analysis was conducted on the comparative estimate – the percentile rank estimate. After collapsing the percentile rank estimates separately for easy and hard tasks, these means were submitted to a 2 (domain difficulty: easy vs. hard) X 2 (condition: verbal information vs. control) X 2 (presentation order: easy/hard vs. hard/easy) X 2 (handedness: consistent vs. inconsistent) mixed-model ANOVA, with a repeated measure on the first factor. There was a main effect of domain difficulty, $F$ (1,
114) = 636.35, \( p < .001 \) \( d = 3.51 \), with participants estimating higher percentile rank for the set of easy tasks (M=78.2) than for the set of hard tasks (M=22.9). There was also main effect of presentation order, \( F (1, 114) = 14.919, p < .001 \) partial-\( \eta^2 = .12 \), with participants who estimated percentile on hard tasks first gave higher percentile estimates (M=54) than participants who estimated percentile on easy tasks first (M=47). There were no other significant main effects or interactions.

The two main hypotheses for this analysis were not supported. The first hypothesis was the verbal debiasing would reduce the above and below average effects. The interaction that would have supported this hypothesis was the domain difficulty by condition interaction. The domain difficulty by condition interaction was not significant, \( F (1,114) = 2.267, p < .135 \) partial-\( \eta^2 = .019 \).

Table 6. Mean absolute ability estimates for self and peers on easy and hard tasks.

<table>
<thead>
<tr>
<th>Ability</th>
<th>Absolute Self-Estimates</th>
<th>Absolute Peer Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Easy Using Mouse</td>
<td>9.38</td>
<td>1.19</td>
</tr>
<tr>
<td>Driving</td>
<td>7.79</td>
<td>1.93</td>
</tr>
<tr>
<td>Riding Bicycle</td>
<td>8.71</td>
<td>1.36</td>
</tr>
<tr>
<td>All Easy</td>
<td>8.62</td>
<td>1.49</td>
</tr>
<tr>
<td>Hard Playing Chess</td>
<td>2.98</td>
<td>2.23</td>
</tr>
<tr>
<td>Juggling</td>
<td>2.33</td>
<td>1.89</td>
</tr>
<tr>
<td>Computer Programming</td>
<td>3.18</td>
<td>2.43</td>
</tr>
<tr>
<td>All Hard</td>
<td>2.83</td>
<td>2.18</td>
</tr>
</tbody>
</table>

The second hypothesis was verbal debiasing would have a larger debiasing effect on consistent handers than inconsistent hander in their estimations of percentile rank. Specifically, compared to the control conditions, consistent handers would show a larger
reduction in the above- and below-average effects than inconsistent handers would. As part of this hypothesis it was also predicted that consistent and inconsistent handers would not differ nor show the above or below average effects in the verbal debiasing condition. The interaction that would have supported these hypotheses was a three-way interaction between handedness, domain difficulty and condition. This interaction was not significant, $F(1, 114) = 1.36, p < .245$ partial-$\eta^2 = .012$. This shows that the verbal debiasing information had the same effect on both consistent and inconsistent handers, regardless of difficulty. In addition there were no differences in the above and below average effects between consistent and inconsistent handers, which would have been shown if the three-way interaction was significant. If there was a four-way interaction between domain difficulty, handedness, condition, and presentation order, then there would have been reason to run separate analyses on easy and hard percentile estimates. Because this four way interaction was not significant, $F(1, 114) = 1.65, p < .202$ partial-$\eta^2 = .014$, there was no reason to run separate analyses on percentile estimates based on domain difficulty.

To investigate the egocentrism debiasing effects of providing verbal base rate information, a series of regression analyses were conducted following the methods of Rose, Jasper, and Corser (2012). Egocentrism can be observed by entering self-estimates of skill and estimates of others’ skill as predictors of estimated percentile rank. Previous researchers have used absolute self and other judgments of skill as predictors of percentile rank (Kruger 1999; Rose, et al 2012; Lanning 2011). Absolute estimates for the self and for peers were aggregated separately across both easy and hard tasks. In
addition, percentile estimates were aggregated across easy and hard tasks to yield one overall estimate of percentile rank.

Due to the changes from Rose, Jasper and Corser (2012), presentation order and condition were added to the regression model. Presentation order was not hypothesized to be a significant effect in this experiment. Because presentation order was significant in the mixed-model ANOVA, it was entered into the regression model. Order of presentation has not been theorized to effect the above and below average effects or the level of egocentrism in these biases (Kruger, 1999). The first hierarchical regression analysis was conducted to investigate if presentation order interacted with any other predictor variable. The main effects of absolute self-estimate of skill, peer estimates, presentation order, condition, and degree of handedness were entered in the first step. Two-way interaction terms were entered in a second step. Three-way interactions were entered in a third step, with four-way interactions in a fourth step, and the five-way interaction entered in the fifth step.

The regression analysis revealed several significant main effects in the first step. Absolute self-estimate of skill was a significant predictor, \( \beta = .621, t (120) = 8.13, p < .001 \), where higher absolute self-estimates were associated with higher percentile estimates. Absolute estimates of peers was a significant predictor, \( \beta = -.173, t (120) = -2.32, p = .022 \), where lower peer estimates were associated with higher percentile estimates. This shows that both self-estimate and the estimates of others accounted for a significant amount of variance in participants’ estimated percentile rank. In addition to estimates of skill, presentation order was a significant predictor, \( \beta = .192, t (120) = 2.66, p = .009 \), with higher percentile estimates being given when participants estimated
percentile rank on hard tasks first. Condition was also a significant predictor, $\beta = -0.154$, $t(120) = -2.20$, $p = 0.03$, where higher estimates of percentile rank were associated with the verbal debiasing condition. Handedness was not a significant predictor of percentile rank. Presentation order did not interact with any other predictor in steps two through five. This shows that presentation order was only a main effect. Because presentation order did not interact with any other predictor variable, all interaction terms that included presentation order were removed from the model. Further supporting the removal of interaction terms involving presentation order, is the finding that presentation order has not been reported to affect the above- and below-average effects or egocentrism (Kruger, 1999; Rose et al, 2012).

Another hierarchical regression analysis was conducted using four-steps. All main effects were entered in the first step. The two-way, three-way, and four-way interactions entered in a second step, third step, and a fourth step, respectively. There were two hypotheses that were investigated in this analysis. The first hypothesis was that providing verbal base rate information would reduce egocentrism compared to the control condition. The interaction that would show this would be the three way interaction between self-estimates of skill, peer estimates of skill, and condition. The second hypothesis was that providing verbal debiasing information would affect egocentrism in consistent handers, more so than inconsistent handers, would be supported by a significant four-way interaction between self-estimates of skill, peer estimates of skill, condition and degree of handedness.

The first step of the regression yielded the same results of the first step described above, because all main effects were retained. As described above, self-estimates, peer
estimates, presentation order, and condition were significant predictors in the first step. Interaction terms including presentation order were removed from all remaining steps. In the second step, the self by condition interaction was significant, $\beta = -0.177$, $t (120) = -2.28$, $p = 0.025$, indicating that self-estimates were weighted significantly different based on condition. In the third step, the self by degree of handedness interaction was significant, $\beta = 0.168$, $t (120) = 2.188$, $p = 0.031$, indicating that self-estimates were weighted differently based on degree of handedness. The two-way interaction between self-estimates and condition was also significant, $\beta = -0.227$, $t (120) = -2.90$, $p = 0.005$, in the third step. The third step also revealed the three-way interaction between self-estimates, peer estimates and degree of handedness was significant, $\beta = -0.204$, $t (120) = -2.32$, $p = 0.023$. The first three steps indicated several significant interactions but did not account for the variance accounted for by the hypothesized four-way interaction described above.

The fourth step of the hierarchical regression analysis included all main effects and all interactions, including the four-way interaction. The hypothesized four-way interaction was between self-estimates, peer estimates, condition, and degree of handedness. The fourth step revealed two significant two-way interactions, one significant three-way interaction, and the hypothesized significant four-way interaction. The self-estimate by degree of handedness interaction was significant, $\beta = 0.193$, $t (120) = 2.51$, $p = 0.014$, and the self-estimate by condition interaction was also significant, $\beta = -0.232$, $t (120) = -2.28$, $p = 0.025$. The three-way interaction between self-estimates, peer estimates, and degree of handedness was also significant, $\beta = -0.200$, $t (120) = -2.33$, $p = 0.022$. The two- and three-way interactions were qualified by the hypothesized significant four-way interaction, $\beta = -0.182$, $t (120) = -2.0$, $p = 0.048$. 
To interpret the significant four-way interaction further, separate regression analyses were conducted on the control condition and the verbal debiasing condition. Absolute self-estimate of skill, the estimate of peer skill, presentation order, and degree of handedness were entered in the first step with percentile estimates as the criterion. The two-way and three-way interaction terms between self-estimates, peer estimates, and degree of handedness were entered in a second step. The regression analyses for the control condition and the verbal debiasing condition are reported separately below.

The first step in the regression analysis conducted on the control condition revealed two significant main effects. Absolute self-estimate of skill was significant, $\beta = .750$, $t (62) = 7.33$, $p < .001$, where higher (lower) self-estimates of skill were associated with higher (lower) percentile estimates. The absolute estimate of the peer skill was significant, $\beta = -.218$, $t (62) = -2.12$, $p < .001$, where higher (lower) peer estimates were associated with lower (higher) percentile estimates. This shows the typical egocentric weighting of self-estimates of skill compared to estimates of others’ skill. The second step of the regression analysis revealed no significant interactions. This indicates the four-way interaction, from the main regression analysis, was driven by the verbal debiasing condition, as described below.

The first step of the regression analysis conducted on the verbal debiasing condition revealed two significant main effects. Absolute self-estimate of skill was significant, $\beta = .555$, $t (57) = 4.72$, $p < .001$, where higher (lower) self-estimates of skill were associated with higher (lower) percentile estimates. Unlike the control condition, presentation order was significant, $\beta = .291$, $t (57) = 2.69$, $p = .01$, where higher percentile estimates were given when participants estimated percentile on hard tasks.
followed by easy tasks. The second step revealed three significant interactions. The two-way interaction between self-estimates and degree of handedness was significant, $\beta = .294$, $t (57) = 2.67, p = .01$, and the two-way interaction between peer estimates and degree of handedness was also significant, $\beta = -.354$, $t (57) = -3.0, p = .004$. Both two way interactions were qualified by the significant three-way interaction between self-estimates, peer estimates, and degree of handedness, $\beta = -.358$, $t (57) = -2.92, p = .005$.

To interpret this three-way interaction further, percentile estimates were plotted as a function of degree of handedness (consistent or inconsistent) at 1 standard deviation above and below the mean of absolute estimates of skill. Refer to Figures 2 and 3 for graphical representation of this interaction. From the results, it appeared that consistent and inconsistent handers differed in the judgment weight they gave to absolute self-estimates when predicting percentile rank. The slope of the line for self-estimates for consistent handers was not significant, $\beta = .206$, $t (25) = 1.09, p = .289$, but was significant for inconsistent handers, $\beta = .735$, $t (31) = 5.36, p < .001$. Absolute peer estimates appeared to be predictive of percentile estimates for both handedness groups. The slope of the line for consistent handers was marginally significant, $\beta = .405$, $t (25) = 1.90, p = .07$, where higher (lower) estimates of peer skill was associated with higher (lower) percentile estimates. The slope of the line for inconsistent handers was significant, $\beta = -.312$, $t (31) = -2.28, p = .031$, where higher (lower) estimates of peer skill were associated with lower (higher) percentile estimates. This analysis shows that verbal debiasing had differential effects on egocentrism based on degree of handedness. In fact, nominally more judgment weight was given to absolute peer estimates than self-estimates of skill for consistent handers. Inconsistent handers showed that not only were self-estimates of
skill a significant predictor, but peer estimates were also a significant predictor of percentile rank.

Figure 2. Percentile estimates as a function of absolute self and peer estimates for consistent handers, in the verbal debiasing condition.
Figure 3. Percentile estimates as a function of absolute self and peer estimates for inconsistent handers, in the verbal debiasing condition
Discussion

This experiment was designed to investigate the effects of providing verbal base rate information on the above and below average effects. In addition, this experiment was intended to be an extension of Rose, Jasper, and Corser (2012). There were multiple hypotheses for this experiment and each will be discussed separately below.

A main hypothesis was that the above and below average effects would be reduced or eliminated by providing participants with information about the difficulty others have with the activities being judged. This hypothesis was not supported. The mixed-model ANOVA revealed a non-significant two-way interaction between domain difficulty and condition. This showed that providing verbal base rate information was unsuccessful in debiasing the above- and below- average effects. It may be that providing verbal base rate information is not concrete enough to change participants’ comparative biases. The results also reveal a significant main effect of presentation order. This was not a hypothesized effect based on Kruger (1999) and Rose, Jasper, and Corser (2012). This effect resulted in participants giving higher (lower) percentile estimates, overall, after estimating percentile rank on hard (easy) tasks followed by easy (hard) tasks. This difference in perceived difficulty has been found in a previous study investigating perceived difficulty of test questions based on arrangement (Barcikowski & Olsen, 1975). They found that easy (hard) questions were perceived as being easier (harder) after answering hard (easy) test questions. A possible reason why presentation order was a significant effect here and not in Kruger (1999) could be the method of obtaining percentile estimates. Kruger (1999) asked for percentile estimates on each task.
individually, whereas participants in this study provided percentile estimates on all tasks on one page.

Another main hypothesis was that presenting verbal base rate information would reduce egocentrism participants displayed when making comparative estimates. This hypothesis was based on the idea, described in the introduction, that greater egocentrism may lead to greater base rate neglect. By providing participants with base rate information, it would thereby reduce their level of egocentrism in their comparative estimates. A hierarchical regression analysis was conducted to investigate the impact of providing verbal base rate information on egocentrism. The hypothesis would have been supported by a significant three-way interaction between absolute self-estimates of skill, absolute peer estimates of skill, and condition. The three way interaction was not significant, but the presence of a four-way interaction between self-estimates, peer estimates, condition, and degree of handedness showed that egocentrism was altered due to the verbal debiasing, based on degree of handedness.

Based on previous research (Lanning, 2011; Rose, Jasper, & Corser, 2012), it was hypothesized that consistent handers would show greater reductions in egocentrism after being presented with verbal base rate information than inconsistent handers. The reason they would show a greater reduction is that consistent handers have shown greater levels of egocentrism in their comparative estimates (Lanning, 2011; Rose et al., 2012); therefore, presenting them with information should have a greater effect on egocentric weighting. This hypothesis was supported. In fact, there was a nominal reversal in the judgment weight of self-estimates and peer estimates. Typically, self-estimates are weighted more heavily than peer estimates. Self-estimates and peer estimates were
significant predictors of percentile rank for consistent handers, in the verbal debiasing condition. Inconsistent handers showed the typical egocentric weighting although peer estimates were still a significant predictor of percentile rank. It can be inferred, that providing verbal base rate information to inconsistent handers did not alter the level of egocentrism they show compared with previous studies reporting similar findings (Lanning, 2011; Rose, Jasper, & Corser, 2012).

The overall debiasing effect of providing verbal base rate on the above- and below- average effect is mixed. It did not reduce the effect in terms of percentile estimates, with participants still showing the above- and below-average effects. Providing verbal base rate information did reduce the level of egocentrism shown in the above- and below-average effects, but only in consistent handers. This suggests that providing this type of debiasing information can have an effect on egocentrism in comparative biases but only with certain groups. The mixed nature of the results could be due to the information being provided not being as concrete as would be necessary for complete debiasing to occur.
Chapter Nine

General Discussion

Are you above or below average and how do you know? What information do people use to answer the previous question? Previous researchers find that people tend to see themselves as above average on easy tasks and below average on hard tasks (Kruger, 1999; Burson et al, 2006; Lanning, 2011; Rose, Jasper & Corser, 2012). The researchers above have supported an explanation based on egocentrism. Egocentrism is shown through a regression analysis by participants giving more judgment weight to self-estimate of ability than estimates of others’ ability. Egocentrism implies that information about the self is more attended to than information about others. Lanning (2011) and Rose, Jasper and Corser (2012) also found that consistent handers show greater degrees of the above and below average effects and more egocentrism in their comparative judgments, handedness findings and implications will be explored later in the discussion. Egocentrism is not the only explanation that has been proposed.

Other researchers have suggested that “noise plus bias” can explain the above and below average effects (Burson et al, 2006). The “noise” refers to the inherent difficulty of knowing how well another person performs a task while the “bias” is driven by the absolute difficulty of the task. Reductions in the above and below average effects have also been found by manipulating the target and referent (Krizan & Suls, 2008), which shifts the focus of the attention from a single person to the group and vice versa. Reductions have also been seen when increasing the familiarity of the referent (Kruger et al., 2008). The above studies suggest that increasing the attention to or the knowledge of others can reduce the above- and below-average effects. This idea is supported by Rose
and Winschitl (2012). They had participants engage in multiple rounds of a throwing competition in which knowledge, in the form of visual feedback, was gained by watching their competitor on consecutive rounds. Rose and Windschitl (2012) showed that participants accounted for the difficulty their competitor had and also showed less egocentrism in their likelihood estimates of winning the following round of competition. It could be hypothesized from these studies that providing participants with explicit information about others could debias the above and below average effects.

The present research proposed that inaccurate weighting of base rate information, either supplied or predicted, can also explain the above and below average effects. It was also stated that base rate neglect could stem from participants’ egocentrism. So, by providing base rate information, the above and below average effects should be significantly affected. The base rate information that was given to participants was either numerical, in Experiment 1, or verbal, in Experiment 2. It was predicted that providing explicit numerical feedback, in Experiment 1, about others would increase, decrease, or reverse the above and below average effects, depending on the level of feedback. In Experiment 2, it was predicted that providing participants with verbal base rate information, adapted from a debiasing prime used in Windschitl et al. (2008), would debias the above and below average effects and also reduce the amount of egocentrism displayed in the judgment weights of self and peer estimates. The results from Experiments 1 and 2 revealed partial support for the above predictions.

**Numerical Base Rate Information and the Above and Below Average Effects**

The goal of Experiment 1 was to show that providing participants with numerical base rate information would increase, decrease, or reverse the above- and below-average
effects, depending on level of feedback. Three levels of numerical information were provided to participants with each level having different predicted effects on percentile estimates. Recall from the introduction that the accurate base rate information (50th percentile) was predicted to reduce the above average effect in the easy task and the below average effect in the hard task. A biased base rate was presented that made the tasks seem harder than it actually are (75th percentile) was predicted to increase the below-average effect in the hard task and reduce the below-average effect in the easy task. A biased base rate that made the tasks seem easier than they actually are (25th percentile) was predicted to increase the above-average effect in the easy task and reduce the below-average effect in the hard task. In Experiment 1, the results revealed that providing numerical base rate information had a significant effect on estimates of percentile rank, but only in the hard condition.

The ANOVA conducted on participants’ percentile estimates made on easy trivia questions, revealed that the three levels of feedback provided to participants did not have any significant effects on percentile estimates. It is worth noting that the effects of the levels of feedback were in the hypothesized direction in the easy condition. The lowest feedback (e.g. 25th percentile) resulted in the highest estimated percentile, the highest feedback (e.g. 75th percentile) resulted in the lowest estimated percentile, and the true average feedback (e.g. 50th percentile) resulted in percentile estimates between the highest and lowest feedback conditions. The ANOVA conducted on participants’ percentile estimates, in the hard condition, revealed significant effects of level of feedback. The 75th percentile feedback condition resulted in the lowest estimated percentile rank with a mean of 32.5, showing the typical below average effect. The 50th
percentile feedback resulted in a debiasing of the below average effect with a mean of 55.6, which was not significantly different than 50. The 25\textsuperscript{th} percentile feedback condition resulted in a complete reversal of the below average effect with a mean percentile estimate of 70.5. Participants were resistant to the effects of feedback on easy trivia questions whereas they were open to feedback on hard trivia questions.

The negligible effects of feedback on easy tasks and the significant effect of feedback on hard tasks have been found in research on overconfidence and calibration. In experiment 2 of Petrusic and Baranski (1997), they investigated the effects of trial-by-trial feedback on easy and hard perceptual judgments. They presented participants with two 5mm lines on the left and right sides of a computer screen with a centrally presented 10mm line. Participants were instructed to indicate which line was closer to the centrally presented line and give the confidence in their judgment. The perceptual judgments were categorized as hard or easy to make, based on smaller or larger differences in distance from the center. After providing their judgment, participants were given feedback about the correctness of their answer. On easy judgments, feedback either was ineffective or made calibration worse whereas feedback on hard judgments resulted in improved calibration. Petrusic and Baranski (1997) found the exact same feedback by difficulty interaction that was found in Experiment 1 of this dissertation, even though the judgments made were different. Hoch and Loewenstein (1989) report a similar feedback by difficulty interaction. Potential reasons for this pattern are explored below.

The above average effect was resistant to feedback whereas the below average effect was not from the results of Experiment 1 of this dissertation. There are a couple potential reasons for this pattern. A motivation explanation (Chambers, 2008) can
account for the lack of difference between all levels of feedback in the easy condition, and the significant increase in percentile rank estimates in the hard condition, except for the 75th percentile feedback condition. Participants may be resistant to the feedback in the easy condition because they are motivated to see themselves as above average, subsequently ignoring feedback about others. The motivation to perceive oneself as not below average, in the hard condition, can account for the increase in estimated percentile rank in the 50th and 25th percentile feedback conditions. This account falls short in the 75th percentile feedback condition of the hard condition, which produced significantly lower percentile estimates than the other two levels of feedback.

Motivation has been used to explain participants’ comparatively better ratings on a series of positive and negative personality traits. Alicke et al. (2001) showed that participants will even rate themselves better than others, even when the “other” student’s ratings are actually their own from an earlier session. They described this effect as the “better than myself effect”. So, it could be that there was motivation to perceive the self as not below-average, in the 50th and 25th percentile feedback levels of the hard condition; therefore, participants took the opportunity to increase their relative standing. The motivation account still does not account for the lower percentile estimates in the 75th percentile feedback condition.

An explanation that could account for the pattern described above is based on the relative certainty of their performance, on the easy and hard trivia questions. In the easy condition, participants could have been relatively more certain that their performance was representative of performing above-average. Because of that level of certainty, participants did not adjust their estimates of percentile rank. This level of resistance to
feedback in the easy condition can be inferred from Petrusic and Baranski (1997), as described above. In the hard condition, there may be more uncertainty of what could be perceived as representative of a good or bad performance. This uncertainty opened participants up to the reception of information about others, which helped provide representative information about self-performance. This explanation would be in agreement with research on the availability and representativeness heuristics concerning decisions made under uncertainty (Tversky & Kahneman, 1974). This idea is also supported in a review by Chambers (2008) that describes the effects of selective accessibility and availability of information about the self-compared to information about others. This would also give theoretical support to research that finds reductions in the above and below average effects when familiarity of the referent is increased (Kruger et al., 2008) and the likelihood of winning a competition when a competitor is observed in repeated competition (Rose & Windschitl, 2012).

Secondary to the hypotheses about the effect of numerical base rate information on the above and below average effects were the hypotheses based on degree of handedness. Specifically, it was hypothesized that consistent handers and inconsistent handers would not differ in the degree to which they showed the above- or below-average effects. This hypothesis was supported by a non-significant three-way interaction between difficulty, level of feedback and degree of handedness. This showed that consistent and inconsistent handers were equally affected by the different levels of numerical feedback in the easy and hard conditions. There was a significant main effect of handedness that was not hypothesized. The main effect showed that inconsistent handers estimated higher percentile rank than consistent handers. Because there were not
any two- or three-way interactions with handedness or any previous research on degree of handedness and the effects of numerical feedback, it is difficult to draw any theoretical conclusions from this main effect.

**Verbal Base Rate Information and the Effects of Presentation Order**

As described earlier in the discussion, verbal base rate information was presented to half of the participants in Experiment 2 to investigate the effect on the above and below average effects. The materials for Experiment 2 were derived from Rose, Jasper, and Corser (2012). There were a few changes made to their procedure for the inclusion of a verbal base rate debiasing condition. The general debiasing information format was adapted from Windschitl et al (2008). Rose et al. (2012) asked participants to make three judgments about three easy (e.g. computer mouse usage, riding a bike, and driving a car) and three hard (e.g. programming a computer, juggling, and playing chess) tasks. The three judgments were; to estimate percentile rank, to estimate absolute self-skill, and to estimate the skill of their classmates. Participants made those three judgments in that order for each task separately. In Experiment 2 of this dissertation, participants were asked to estimate absolute self-skill and the absolute skill of their classmates (peers) on all six tasks. After providing absolute estimates of skill, participants estimated percentile rank on all six tasks on one page.

There were multiple hypotheses for Experiment 2. One hypothesis was that providing verbal base rate information would significantly reduce or eliminate the above and below average effects compared to providing no information. It was also hypothesized that neither handedness group would show the above or below average effect in the verbal debiasing condition. From this it was expected that in the control
condition consistent and inconsistent handers would show differences in the above- and below-average effects, based on previous research (Lanning, 2011; Rose et al., 2012). In addition, it was hypothesized that the inclusion of verbal base rate information would reduce or eliminate egocentrism in the regression analysis, with this effect being more pronounced in consistent handers. Each hypothesis will be discussed separately below.

The hypothesis that presenting verbal base rate information to participants, prior to estimating percentile rank, would reduce or eliminate the above and below average effects was not supported. The mixed-model ANOVA revealed significant main effects of presentation order and domain difficulty with no other significant main effects or interactions. The domain difficulty main effect showed that participants estimated percentile significantly higher on easy tasks than on hard tasks. The key two-way interaction, which would have supported the above hypothesis, between difficulty domain and condition was not significant. The results show that using verbal base rate information was not able to debias the above- or below-average effect. It may be that the information is not concrete enough to be an effective means of debiasing these effects. The verbal information used, although it described the general difficulty of the tasks, was abstract enough that participants could have interpreted it differently than intended. For example, the debiasing information described the tasks as either easy or hard for most people. Although it says easy or hard for most people, it does not explicitly describe how easy or how hard it is for most people. This could account for the difference in the debiasing effects of providing base rate information in Experiment 1 (numerical) and Experiment 2 (verbal).
The significant main effect of presentation order on percentile rank estimates is one of potential methodological concern. Kruger (1999) reported in the methods section that presentation order of hard tasks and easy tasks were counterbalanced, but reported no significant effects of order in the results. Rose, Jasper, and Corser (2012), using the materials from Kruger (1999), did not report any manipulation of presentation order. Because there were not any reported effects of presentation order, it was not hypothesized to have an effect on percentile estimates in Experiment 2. The results from Experiment 2 of this dissertation show that participants provided significantly higher (lower) percentile ranks when estimating percentile on hard (easy) tasks first. This general finding is supported by research on test item arrangement (Barcikowski & Olsen, 1975).

Barcikowski and Olsen (1975) investigated the perceived difficulty and performance on a midterm exam. The test questions were presented from hard to easy or easy to hard. They found that students perceived hard questions as being harder after answering easy questions, and easy questions as being easier after answering hard questions. Although it did not change the students’ performance on the test, it did change their perception of how difficult the questions were. This is relevant in the Kruger (1999) paradigm because estimated percentile rank was significantly affected by the perceived difficulty of the task in Experiment 2 of this dissertation. It also suggests that researchers may find artificially inflated or deflated above- and below- average effects, depending on the presentation order of easy and hard tasks. A suggestion to remedy this potential problem is to ask about easy and hard tasks in separate conditions.

As stated above, it was hypothesized that in the control condition consistent and inconsistent handers would show differences in the above- and below-average effects,
with consistent handers showing larger degrees of both. It was also hypothesized that neither handedness group would show the above- or below-average effect in the verbal debiasing condition. Neither hypothesis was supported. The reason could be because of the specific methods of obtaining percentile estimates in Experiment 2 compared to the methods of Rose, Jasper, and Corser (2012). Rose et al. (2012) had participants provide percentile estimates and absolute estimates of skill for the self and for classmates on each task separately. In Experiment 2 of this dissertation, participants provided absolute estimates on each tasks separately then provided percentile estimates on all tasks on the same page of the experiment booklet. The separation of absolute judgments and percentile rank estimates allowed for the inclusion of the verbal debiasing condition. Because of the separation of time and space, each percentile estimate for each individual task could have been affected by having to estimate percentile rank on all tasks on the same page.

As part of the hypotheses for Experiment 2, the effects of providing verbal base rate information on egocentrism displayed in the above- and below-average effects were investigated. The stated hypothesis was that providing verbal base rate information to participants would reduce the level of egocentrism they showed in the hierarchical regression analysis. In addition, it was also hypothesized that consistent handers would show a significant reduction in the typical egocentric weighting after being presented with verbal base rate information. Absolute self-estimates of skill, estimates of classmates’ skill, degree of handedness, condition, and presentation order were entered into the regression as predictors of percentile rank. Because presentation order did not have any higher order interactions with other predictors; therefore, the interaction terms
that included presentation order were excluded from the model. It was excluded based on previous research not reporting any effects of presentation order on egocentrism (Kruger, 1999). Presentation order was left in as a main effect, because it was a significant main effect in the mixed-model ANOVA of Experiment 2.

The resulting regression analysis revealed several significant predictors. The main effects of absolute self-estimate, peer estimates, presentation order, and condition were significant predictors of percentile rank. The key three-way interaction that would have supported the prediction that egocentrism was reduced after receiving verbal base rate information was between self-estimates, peer estimates, and condition. The three-way interaction was not significant. From the lack of significance, it could be inferred that providing verbal base rate information did not alter participants’ level of egocentrism, if the four-way interaction was not significant. The four-way interaction between self-estimate, peer estimate, condition and degree of handedness was significant. This suggested that consistent and inconsistent handers were affected differently by the presentation of verbal base rate information.

After simplifying the four-way interaction, support for the hypothesis that consistent handers would be influenced more by verbal base rate information than inconsistent handers was found. In the control condition, the typical egocentric weighting occurred with more judgment weight being given to the self than to peers, regardless of degree of handedness. In the verbal debiasing condition, a significant three-way interaction between self-estimates, peer estimates, and degree of handedness emerged. Upon further investigation, the slope of the line for self-estimates was significant for inconsistent handers as was the slope for peer estimates. This is in line with previous
findings that inconsistent handers show reduced levels of egocentrism in comparative estimates (Lanning, 2011; Rose et al., 2012). It can be inferred that providing verbal debiasing has relatively little effect on inconsistent handers’ weighting of self and peer estimates. This was not the case with consistent handers. The slope of the line for self-estimates for consistent handers was not significant nor was the slope of the line for peer estimates. This shows that consistent handers were influenced more by the verbal debiasing than inconsistent handers; therefore, the hypothesis that consistent handers level of egocentrism would be affected more by the verbal debiasing than inconsistent handers was supported.

There are potential reasons why consistent handers were more influenced by verbal base rate information. The reason is consistent with conclusions from Lanning (2011) and Rose, Jasper, and Corser (2012). Because consistent handers show greater levels of egocentrism than inconsistent handers, there is a relatively larger reduction in egocentrism that could be achieved by providing base rate information. The explanations for the differences in egocentrism found in Lanning (2011) and Rose et al. (2012) were based on inconsistent handers having greater access to right hemisphere theory of mind areas. Having greater access to these areas better enables inconsistent handers to incorporate the estimations of other peoples’ performance into comparative estimates of ability. This would lead to a greater inclusion of information about others in their comparative estimates. The verbal base rate information provided in Experiment 2, forced participants to think about the performance of others and the difficulty others have with the activities that were judged. Because consistent handers may not naturally incorporate others’ performances, as much as inconsistent handers, the verbal base rate
information was more influential on their comparative estimates. Providing verbal base rate information may have reduced the effect of having relatively less access to the theory of mind areas of the right hemisphere.

From Experiment 2 it may be concluded that, using the specific methodology in this study, providing verbal base rate information does not debias the above- and below-average effects. It may be that the information is not concrete enough to reduce these biases. It may also be inferred that providing verbal base rate information has the potential to reduce egocentrism that is found in these biases, but only with consistent handers. With results from Experiment 2 and the findings from Lanning (2011) and Rose et al. (2012), it provides further evidence that inconsistent handers are truly less egocentric than consistent handers, regardless of being told to consider others. An interesting finding is, for consistent handers, the typical negative beta weight for peer estimates (Kruger, 1999; Lanning, 2011; Rose et al., 2012) in the regression analysis was not found. In fact, the beta weight for peer estimates was positive. This suggests that consistent handers may be applying their perceptions of others’ performance onto themselves.

**Why is being better calibrated important?**

Why is it important to be accurate about the self’s relative position compared with others? If people have above- or below-average views of themselves then they may face adverse consequences. Self-esteem could be greatly affected by the above- and below-average effects. If people perceived themselves as above average they may decide to engage in activities that they should not. As a result they may find they are not above-average and suffer a loss of self-esteem. This loss could lead to the person not engaging
in other activities they think they are above-average. Something slightly different would occur if a person saw themselves as below-average. If people perceived themselves as being below-average they might not engage in an activity they might actually be good at performing. If they would actually engage in the activity they may find themselves to be better than what they thought. Finding out that a person is better than what was thought could increase self-esteem and cause them to continue to engage in the activity. Being better calibrated would lead to people engaging in activities when they should instead of when they should not.

If people were taught at an early age to use base rate information when comparing the self to others it could result in better calibrated adults. Many children experience detriments to their self-esteem because they think they are worse than others. If children were taught to think of themselves in an accurate way by incorporating information about others, then some of the troubles of adolescents may be avoided. The resulting effects on self-esteem and engagement in many different activities would be positive.

**Limitations to the study of the above- and below-average effects**

There are several limitations between Experiment 1 and Experiment 2. The biggest limitation in Experiment 1 was the lack of a no feedback control condition. While the findings from Lanning (2011) allow for a relative comparison, it does not allow for a statistical comparison. Future studies investigating the effects of providing numerical base rate information on the above and below average effects should include a no feedback control condition. On this same line, to fully investigate the interaction between degree of handedness and the effects of feedback, on the above and below average effects, a control condition must be included. While it appears that numerical base rate
information had larger effects on the above and below average effects than did verbal base rate information, a direct comparison between these two types of information cannot be made. To directly compare the effects of numerical versus verbal base rate information, it will have to be manipulated using the same tasks, whether hypothetical performance based tasks or actual performance based tasks.

A limitation unique to Experiment 2 would be the lack of numerical base rate information about easy and hard activities. If this information were available then a direct comparison could be made between the effects of providing numerical versus verbal base rate information on the above and below average effects using the tasks from Kruger (1999). A limitation that applies to the current research, Lanning (2011), and Rose, Jasper, and Corser (2012) is the lack of brain imaging when making social comparisons. Although this research and the two studies listed above argue that having greater access to right hemisphere processes reduces egocentrism, this claim cannot be made with absolute certainty without brain imaging data. Future research should address the limitations discussed here.

**Future Directions**

Researchers should continue to investigate the differences in egocentrism displayed by consistent and inconsistent handers with the possible inclusion of brain imaging while making social comparisons. Because of the research conducted by Lanning (2011), Rose et al. (2012), and the findings in this research, strength of handedness should be measured in all social comparison studies. The effect of providing numerical versus verbal base rate information on the above and below average effects should be investigated further. Verbal base rate information should be given to
participants estimating percentile rank on easy and hard trivia. This information would describe the difficulty of the trivia questions that others have answering the questions. Numerical base rate information should be collected and provided to participants estimating percentile rank on the tasks included in Kruger (1999). Providing participants with this information may reduce or eliminate the biases on these tasks.

Specifically pertaining to Experiment 1, a future direction could be to change the frame of the feedback given to participants. This would change the feedback from telling participants that the typical student answered X out 20 correctly to the typical student answered X out of 20 incorrectly. This might result in the elimination or reversal of the above and below average effects. It is difficult to say what effect changing the frame of the feedback would have on these biases, because there has not been any research conducted on the topic. Lastly, the investigation of the effects of providing numerical versus verbal base rates should be expanded to include topics such as health outcomes, getting the job a person wants after college, or other more impactful life events. Research on the debiasing effects of providing numerical and verbal base rate information on the above- and below-average effects could have wider applications. If people are taught at a young age to pay attention to and incorporate accurate information about other people, then some potential problems could be avoided. For example, if a person were to see himself/herself as above-average and decide to engage in an activity only to find out the contrary, then self-esteem could be reduced. On the other hand, if a person saw himself/herself as below-average then they might not engage in an activity in which they may be good. The above-average effect may lead people to engage in
activities they should refrain, whereas the below-average effect may lead people to refrain when they should engage.
References


Appendix A

**Edinburgh Handedness Inventory**

Please indicate your preference in the use of hands for each of the following activities or objects by placing a check in the appropriate column.

<table>
<thead>
<tr>
<th>Always Left</th>
<th>Usually Left</th>
<th>No Preference</th>
<th>Usually Right</th>
<th>Always Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawing</td>
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<tr>
<td>Spoon</td>
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<tr>
<td>Open Jars</td>
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<tr>
<td>Toothbrush</td>
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<tr>
<td>Throwing</td>
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</tr>
<tr>
<td>Comb Hair</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scissors</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Knife</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Striking a match</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. Male __________
   Female __________

2. Country of Origin ___________________

3. Caucasian __________
   African American __________
   Asian ______________
   Arabic _____________
   Other ______________
Appendix B

Experiment 1 Materials

Easy Questions (correct answer; % subjects answering correctly) Criteria= 80-100% correct

1. What is the name of the comic strip character who eats spinach to increase his strength? (Popeye; 97.4)

2. What is the name of the long sleep some animals go through during the entire winter? (Hibernation; 97.0)

3. What is the last name of the brothers who flew the first airplane at Kitty Hawk? (Wright; 91.9)

4. What is the capital of France? (Paris; 91.5)

5. What is the name of a dried grape? (Raisin; 89.6)

6. Which sport is associated with Wimbeldon? (Tennis; 89.6)

7. What is the name of the crime in which a building or property is purposely set on fire? (Arson; 88.1)

8. What is the name of the Lone Ranger’s sidekick? (Tonto; 87.0)

9. Which precious gem is red? (Ruby; 87.0)

10. What is the name of an airplane without an engine? (Glider; 85.6)

11. What is the names of the remains of plants and animals that are found in stone? (Fossils; 85.2)

12. What is the rubber object that is hit back and forth by hockey players? (Puck; 85.2)

13. What is the name for a medical doctor who specializes in cutting the body? (Surgeon; 84.4)

14. What is the name for the inability to sleep? (Insomnia; 83.7)
15. What’s the name of Dorothy’s dog in “The Wizard of Oz”? (Toto; 83.7)

16. What is the last name of the man who showed that lightning is electricity? (Franklin; 83.7)

17. What is the name of the spearlike object that is thrown during a track meet? (Javelin; 83.3)

18. What is the last name of the man who rode horseback in 1775 to warn that the British were coming? (Revere; 81.9)

19. What is the term for hitting a volleyball down hard into the opponent’s court? (Spike; 81.9)

20. What is the name of the severe headache that returns periodically and often is accompanied by nausea? (Migraine; 80.7)

Difficult Questions (correct answer; % subjects answering correctly) Criteria= 30-50% correct

1. What is the name of the unit of measure that refers to a six-foot depth of water? (Fathom; 51.9)

2. What is the last name of the author who wrote “The Old Man and the Sea”? (Hemmingway; 49.6)

3. What is the name of Socrates’ most famous student? (Plato; 47.0)

4. What is the last name of the woman who began the profession of nursing? (Nightingale; 46.7)

5. What is the last name of the man who wrote the “Star Spangled Banner”? (Key; 44.8)

6. What is the last name of the scientist who discovered radium? (Curie; 43.3)

7. What is the name of the first artificial satellite put in orbit by Russia in 1957? (Sputnik; 43.3)

8. Of which country is Buenos Aires the capital? (Argentina; 43.0)
9. What is the name of the furry animal that attacks cobra snakes? (Mongoose; 41.1)

10. In which city is the U.S. Naval Academy located? (Annapolis; 40.7)

11. What country was the first to use gunpowder? (China; 38.1)

12. What is the last name of the man who invented the phonograph? (Edison; 37.0)

13. What is the capital of New York? (Albany; 37.0)

14. In which game are the standard pieces of Staunton design? (Chess; 36.7)

15. What brand of cigarette was the first to have the flip-top box? (Marlboro; 34.8)

16. What is the last name of the author of the book “1984”? (Orwell; 33.0)

17. What is the name of the hillbilly family that had a famous feud with the McCoy family? (Hatfield; 32.6)

18. What is the last name of the author who wrote under the pseudonym of Mark Twain? (Clemens; 32.2)

19. What is the name of the Roman Emperor who fiddled while Rome burned? (Nero; 31.1)

20. What is the last name of the astronomer who published in 1543 his theory that the Earth revolves around the Sun? (Copernicus; 30.4)

Absolute Judgment Questions

1. How many questions do you think you answered correctly?
   ________________ (out of 20)

2. How confident are you in your answer to the above question? (Note: Between 0%-100%)
   ________________

3. How many questions do you think, on average, other students answered correctly?
   ________________ (out of 20)
4. How confident are you in your answer to the above question? (Note: Between 0%-100%)

________________

**Easy Condition Base Rate Manipulation**

Before you answer the next question, I would like to share some information with you. We have administered the same set of questions to UT students in an earlier study and found that the typical UT student got 13 (15, 17) out of 20 correct.

1. How well do you think you did compared to other students? (Give answer in a percentile, 0% to 100%)

________________

2. How confident are you in your answer to the above question? (Note: Between 0% to 100%)

________________

**Hard Condition Base Rate Manipulation**

Before you answer the next question, I would like to share some information with you. We have administered the same set of questions to UT students in an earlier study and found that the typical UT student got 1 (3, 6) out of 20 correct.

1. How well do you think you did compared to other students? (Give answer in a percentile, 0% to 100%)

________________

2. How confident are you in your answer to the above question? (Note: Between 0% to 100%)

________________
Appendix C

Experiment 2 Materials

Verbal Base Rate Information

Before you answer the questions on the following page, we need to inform you about a bias that affects how people think about their abilities compared to others. Making an accurate comparison of ability depends on two things:

1. How skilled you are at the task/activity being compared.
2. How skilled others are at the task/activity being compared.

Both 1 and 2 are equally important when making relative comparisons with others. You have just indicated your estimations for both of the above values, so keep these in mind when making comparisons with others. Previous research has shown that when people are thinking about their ability at a particular task/activity, they mistakenly tend to think only about how well they perform the task/activity and not how well others perform the same task/activity. For example, it is easy for most people to drive a car, operate a computer mouse, or ride a bicycle. Similarly, it is hard for most people to program a computer, juggle, or play chess. Failing to take this into account can lead to biased forms of thinking that we hope you will avoid when making your relative comparisons.

Therefore, before making each judgment on the next page, first consider both your performance and others’ performance. Only then should you respond.

Again, don’t forget to consider how well or poorly others probably do before you give your judgments.
Absolute Skill Judgment Questions

Juggling (Programming a Computer, Playing Chess, Computer Mouse Usage, Riding a Bike, Driving a Car)

1. Rate your skill level at this particular ability.

1 2 3 4 5 6 7 8 9 10

Very
Unskilled

Rate your classmates’ skill level at this particular ability.

1 2 3 4 5 6 7 8 9 10

Very
Unskilled

2. Is it better to be very unskilled or very skilled at this ability?

1 2 3 4 5 6 7 8 9 10

Very
Unskilled

3. In terms of what it means to “drive a car”, how ambiguous is this ability

1 2 3 4 5 6 7 8 9 10

Very Ambiguous-
has many meanings

Very concrete -
has one meaning

4. Have you had any experience with this ability?

_____ Yes  _____ No

If so, please indicate below how experienced you are.
Percentile Judgment Questions

1. Driving a Car (Using a computer, Muse, Riding a bicycle, Programming a computer, Juggling, Playing Chess)

In comparison to other students in this course, how proficient would you rate yourself (on a scale from 0 to 99 where 0 = I’m at the very bottom, 50 = I’m exactly average, and 99 = I’m at the very top) in terms of ability? Please give a number between 0 and 99.

I’m a ____________