

Combining Competitive Situational Factors:
N-Effect and Proximity to a Standard Effect Interaction on Competitive Behavior

by

Alvin W. Tan

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of Bachelor of Science
with Honors in Psychology from the
University of Michigan

2013

Advisor: Dr. Stephen Garcia

Abstract

The interactions between two competitive situational factors, the N-effect and the Proximity to a Standard effect, on competitive motivation were examined in the context of an online survey with a timed word scramble task. The “N-effect” describes the phenomenon where a decrease in number of competitors (N) increases competitive motivation while the Proximity to a Standard effect describes the phenomenon where competitive motivation increases when people are placed near a meaningful standard such as ranks. Four conditions were implemented, namely the small N and away from a standard condition, the large N and near a standard condition, the small N and near a standard condition, and the large N and away from a standard condition. 144 participants were recruited via an Introduction to Psychology course student subject pool at a large public university in the Midwest, where they were random split evenly into all four conditions. Results indicated that the presence of both situational factors led to significantly lower word scramble scores. These current findings suggest that the combined presence of more situational factors might lead to increased competitive arousal which might be detrimental to task performance.

Keywords: competition, motivation, N-effect, proximity, standard, number, competitors

Combining Competitive Situational Factors: N-Effect and Proximity to a Standard Effect
Interaction on Competitive Behavior

It has been well documented that people constantly seek to attain higher standings during our interactions with others (Festinger, 1954; Porter, 1979). This phenomenon, known as social comparison, is not only confined to specific competitive circumstances such as organizational settings or market transactions. It is also commonly displayed in our everyday social interactions with others, may it be our family, peers, or even random strangers. As such, the concepts of social comparison and competitive behavior are closely intertwined, where the act of comparing oneself to others drives competitive behavior (Festinger, 1954; Garcia, Tor & Gonzalez, 2006).

Recent academic research has brought to light certain features of the social environment that affect how people compare themselves to others which subsequently drive or hinder their competitive motivations. These environmental features are classified as situational factors and are prevalent throughout our societies. In this research study, the interactions between two such situational factors, namely the N-effect and the Proximity to a Standard effect, were analyzed to determine their influence on competitive motivation.

The N-effect describes the behavior where competitive motivation increases as the number of competitors (N) decreases and vice versa (Garcia & Tor, 2009). A recent study examined this effect by analyzing state level SAT results for all 50 states. To determine how many test takers on average there were in at a certain venue, the researchers divided the total number of test takers per state by the total number of test taking venues in that particular state. The results displayed a significant negative correlation between number of test takers and SAT scores, in which less test takers at a venue was correlated to higher SAT scores and vice versa (Garcia & Tor, 2009). These results illustrate how the lesser number of competitors, in this case

fellow test takers, the higher the competitive motivation to outdo one another, which is represented by higher SAT scores. To determine if social comparison is the main driving force behind the N-effect, a study was devised to analyze how individual people differ based on their tendencies towards social comparison. It was revealed that participants with consistently high tendencies towards social comparison displayed the N-effect while those with consistently low tendencies towards social comparison did not (Gibbons, & Buunk, 1999). Thus, these research results support the notion that social comparison is the significant driver of the N-effect.

The Proximity to a Standard effect describes the phenomenon where people tend to be more socially competitive near a standard, which are meaningful levels and positions such as a #1 rank in a ranking scale (Garcia et al., 2006). In a fairly recent experiment, Garcia et al. (2006) had participants envision themselves as the CEO of a Fortune 500 company. They were then told that their company was in the process of deciding whether or not to go through with a joint venture with a rival Fortune 500 company. Participants were grouped into three conditions. The first condition was that their company was ranked #3 while the rival was #4 in the Fortune 500 list. The rankings in this condition were both close to a meaningful standard, which was the #1 rank. The second condition was that their company was ranked #103 while the rival was #104 in the Fortune 500 list. The rankings in this condition were not close to any meaningful standard. The third and final condition was that their company was ranked #500 while the rival was #501. The rankings in this final condition were close to a meaningful standard was #500 within the Fortune 500 while #501 was excluded from the Fortune 500 list.

The results supported the Proximity to a Standard effect. All participants in the second condition, where there was no meaningful standard, decided to cooperate with the rival. Only 39% of participants in the first condition, where the meaningful standard of the #1 ranking was

present, decided to cooperate with the rival. Lastly, only 50% of participants in the last condition, where the meaningful standard of the #500 ranking was present, decided to cooperate with the rival. As such, the results of this experiment showed that individuals tend to be more motivated to compete rather than cooperate with others when they find themselves in a position that is close to a meaningful standard (Garcia et al., 2006).

Still, the Proximity to a Standard effect seems to be more prevalent in performance goals than mastery goals (Poortvliet, Janssen, Van Yperen, & Van de Vliert, 2009). In a study conducted by Poortvliet et al. (2009), participants were told to carry out a simple ordering task. The researchers explained to them that there was an ideal ordering and that how they ordered their items would be compared with fellow participants. Participants were then deceived into thinking that their rankings were with #4, #51, or #96, which were high, intermediate, and low ranks respectively. This was followed by participants being told that they could exchange information related to the task with another participant who ranked #5, #52, or #97 respectively.

The results of this study showed that when participants were told to perform better than another participant, which triggers performance goals, they were less likely to exchange information with their fellow participant if they were in the high or low ranked conditions which are meaningful standards as compared to those in the intermediate rank condition. When participants were told to perform better in a second round compared to their performance in the first, which triggers mastery goals, they were more willing to exchange information as they moved further from the #1 rank. As such, these findings suggest that performance goals tend to trigger more social comparisons and competitive motivation near meaningful standards than mastery goals.

These situational factors are not mutually exclusive and frequently occur simultaneously in the many realms of society. As such, it is beneficial to understand the interactions between these factors as well as the difference in magnitude to which they affect competitive motivations when compared on a level playing field. In a recent study on the N-effect and Proximity to a Standard effect in market settings, a survey experiment with a 2 x 2 factorial design in which they varied earning rankings and number of competitive co-workers was devised (Vandegrift & Holaday, 2012). The four scenarios in the experiment were low rank (away from a standard) and small group (small N), high rank (near a standard) and small group (small N), low rank (away from a standard) and large group (large N), and high rank (near a standard) and large group (large N). Competitive motivation in each scenario was operationalized by the proportion of participants that selected a competitive choice rather than a non-competitive choice. Results of this study showed that participants that were in the high rank (near a standard) scenario displayed more competitive behavior, and this was caused by the behavior of the male participants in the study. There were no significant interactions between the two situational factors in the study.

Unlike the study by Vandegrift and Holaday (2012) that focused entirely on competitive behaviors in a market setting, however, this current study aims to analyze whether combining the N-effect and the Proximity to a Standard effect leads to an additive effect or diminishing returns in competitive motivation in a more social and general setting. This study also aims to ascertain which of the two situational factors has a larger influence on competitive motivation in more performance task-oriented scenarios. The benefits of utilizing task performance to measure competitive motivation is that besides merely determining the competitive motivation of participants, it also provides details on possible underlying factors such as arousal or task-competency that could potentially affect competitive motivation. The previously mentioned

study by Poortvliet et al. (2009) also stated that the Proximity to a Standard effect is more prevalent in performance goals. As such, this current study also utilizes the 2 x 2 factorial design to analyze how the N-effect and Proximity to a Standard effect compare and interact in performance task-based scenarios in a more social setting.

In the present study, the independent variables are number of competitors, operationalized as large (15 other competitors) and small (3 other competitors), and proximity to a ranking standard, operationalized as proximate (ranked #2 vying for #1) and not proximate (ranked #35 vying for #34). The dependent variable is competitive motivation, operationalized as the total number of words generated by a participant in a timed word scramble task. From the results of previous studies on the N-effect and the Proximity to a Standard effect, it is firstly hypothesized in this study that there will be a main effect of number of competitors on competitive motivation due to the N-effect, such that participants in the 3 other competitors conditions will score significantly higher on the word scramble task than those in the 15 other competitors conditions.

The second hypothesis is that there will be a main effect of proximity to a meaningful standard on competitive motivation due to the Proximity to a Standard effect, such that participants in the conditions ranked #2 vying for the meaningful ranking of #1 will score significantly higher on the word scramble task than those in the conditions ranked #35 vying for the non-meaningful ranking of #34. The third hypothesis is that word scramble scores in the condition with 15 other competitors ranked #2 vying for the meaningful ranking of #1 will be significantly higher than the scores in the condition with 3 other competitors ranked #35 vying for the non-meaningful ranking of #34. The reasoning behind this third hypothesis is from Vandegrift and Holaday's (2012) study results that showed that the Proximity to a Standard

effect seems to have a more significant effect on competitive motivation than the N-effect.

Lastly, it is hypothesized that in the word scramble score in the condition where there are 3 other competitors ranked #2 vying for the meaningful ranking of #1 will be significantly higher than all other conditions. This is due to the fact that the small number of competitors coupled with the proximity to a meaningful ranking standard will greatly increase competitive motivation.

Method

Participants

A total of 144 participants (65 males, 79 females, $M_{\text{age}} = 18.7$ years, age range: 17-22 years). There were 106 White, 29 Asian, 7 Black or African American, 1 American Indian or Alaska Native, and 1 Native Hawaiian or Pacific Islander participants. They were recruited online via the Introduction to Psychology course student subject pool at a large public university in the Midwest. Participants were all recruited over the span of a regular college semester of approximately three months. This experiment is a 2 (Number of Competitors [N]: large, or small) by 2 (Proximity to a Standard: near a standard, away from a proximate) factorial design. Participants were randomly assigned to the four conditions using an online survey program.

Procedure

Participants were recruited via the Introduction to Psychology Student Subject Pool to participate in a short online survey experiment that would grant them credit towards the requirements of their Introduction to Psychology Class. Deception was utilized in the first component of the survey. Participants were first required to acknowledge that they understood the informed consent prior to the start of the experiment. They were then told to complete a simple 16-question multiple choice quiz (see Appendix). Before starting the quiz, participants were told that the quiz will be timed and scored. Scoring was based on how fast they completed

the quiz without compromising accuracy. To ensure that participants got all the answers right, quiz questions were constructed such that the questions were simple and the answers were obvious. They were also told that their scores would then be compared to their peers who also participated in the survey. This whole component of the experiment was meant to deceive the participant into thinking that he or she was competing with other participants and had his or her results ranked against them. In actual fact, how fast they took to complete the quiz was not recorded.

In the second component of the online survey, participants were instructed to carry out a word scramble task where they were given 45 seconds to create as many actual English words as possible from the letters in a designated word. The word provided was “Department”. Prior to the commencement of the task, participants were randomly allocated into four conditions. In each condition, participants were told that their scores on the previous multiple choice quiz were tabulated. They were given a ranking as well as how many participants were tied with them at that rank.

Participants were either ranked #2 vying for #1 or #35 vying for #34. This manipulation was introduced to factor in the Proximity to a Standard effect, where #2 vying for #1 is a meaningful threshold whereas #35 vying for #34 is not. Participants were also told that they were tied at that rank with either 3 or 15 other participants. To remove the issue of probability of success affecting competitive motivation, it was also clearly stated to participants that the top 2 or 8 respectively at that rank would move up to the next rank, to control for the expected value of the payoff. This manipulation where participants were told of the number of participant competitors was introduced to factor in the N-effect, where 3 other participants represent a small N while 15 other participants represent a large N. The four conditions in this 2 x 2 factorial

design are rank #2 vying for #1 (near a standard) with 3 other participants tied at #2 (small N), rank #2 vying for #1 (near a standard) with 15 other participants tied at #2 (large N), rank #35 vying for #34 (away from a standard) with 3 other participants tied at #35 (small N), and rank #35 vying for #34 (away from a standard) with 15 other participants tied at #35 (large N) (see Table 1).

The last component of the survey required participants to complete 7-point scale mechanism questions on competitive motivation and task ability. This was followed by demographics questions. Finally, participants were debriefed and informed of the actual purpose of the study, which included a brief explanation of the N-effect, Proximity to a Standard effect, and competitive motivation.

Measures

To measure the competitive motivation of each participant, after the 45 seconds, the number of actual English words generated by the participant were added up (e.g., participant one, who was in the rank #2 with 15 others condition, scored 18 words). To ensure that scores only included actual English words, each participant's input was manually tabulated. Higher scores indicate higher competitive motivation while lower scores indicate lower competitive motivation.

Results

At the end of the survey, a manipulation check was carried out by asking participants to report their rank and number of competitors designated to them prior to the word scramble task. This was to ensure that participants were aware of these two key factors of the study when completing the word scramble task. Their reporting accuracy was tested by taking the number of participants who reported the correct rank and number of competitors in each condition and dividing that number with the total number of participants in each condition.

The small N and near a standard condition had a reporting accuracy of 91.7%. The small N and away from a standard condition had a reporting accuracy of 54.1%. The large N and near a standard condition had a reporting accuracy of 88.2%. The large N and away from a standard condition had a reporting accuracy of 58.3%. For each condition, only the scores of the participants that completed the manipulation check correctly were analyzed and included in the results of this study.

It was firstly hypothesized that due to the N-effect, participants in the 3 other competitors (small N) conditions would score significantly higher on the word scramble task than those in the 15 other competitors (large N) conditions. A two-way ANOVA was carried out and the results indicated that there was no significant difference in word scramble scores across the number of competitors conditions, $F(1, 108) = .94, p = .33$. The word scramble scores in the small N conditions ($M = 10.4, SD = 2.77$) did not differ significantly from the scores in the large N conditions ($M = 11.3, SD = 3.87$). This result failed to support the hypothesis that there would be a main effect of number of competitors on competitive motivation.

The second hypothesis stated was that due to the Proximity to a Standard effect, participants in the ranked #2 vying for #1 (near a standard) conditions would score significantly higher in word scramble scores than those in the ranked #35 vying for #34 (away from a standard) conditions. Results indicate that there was no significant difference in word scramble scores across the proximity to a standard conditions, $F(1, 108) = .015, p = .90$. The word scramble scores in the near a standard conditions ($M = 10.8, SD = 3.53$) did not differ significantly from the scores in the away from a standard conditions ($M = 10.9, SD = 3.22$). This result failed to support the hypothesis that there would be a main effect of proximity to a standard on competitive motivation.

The third hypothesis stated that the Proximity to a Standard effect would have a more significant effect on competitive motivation than the N-effect, such that word scramble scores in the condition with 15 other competitors (large N) ranked #2 vying for #1 (near a standard) would be significantly higher than the scores in the condition with 3 other competitors (small N) ranked #35 vying for #34 (away from a standard). To test this hypothesis, an independent samples t-test was carried out. The results showed that scores in the large N and near a standard condition ($M = 11.9, SD = 4.39$) were not significantly higher than scores in the small N and away from a standard condition ($M = 11.4, SD = 3.48$), $t(49) = .475, p = .24$. This result failed to support the hypothesis that the Proximity to a Standard effect has a greater effect on competitive motivation than the N-effect.

The final hypothesis stated that in the condition where there were 3 other competitors (small N) ranked #2 vying for #1 (near a standard), word scramble scores would be significantly higher than all other conditions due to the interaction and additive effect between the Proximity to a Standard effect and the N-effect. A two-way ANOVA was used to determine the interactions between the two effects. Analysis of variance showed a statistically significant Proximity to a Standard by N-effect condition interaction at the $p < .05$ level: $F(1, 108) = 4.77, p = .031$. The results showed a significant interaction of Proximity to a Standard effect and N-effect on word scramble scores. Further independent samples t-tests were carried out to determine the nature of this interaction.

The results showed that scores in the small N and near a standard condition ($M = 9.85, SD = 2.09$) were significantly lower than scores in the large N and near a standard condition ($M = 11.9, SD = 4.39$), $t(62) = -2.41, p = .00$. The results also showed that scores in the small N and near a standard condition ($M = 9.85, SD = 2.09$) were significantly lower than scores in the small

N and away from a standard condition ($M = 11.4$, $SD = 3.48$), $t(51) = -1.97$, $p = .026$. The results showed that scores in the small N and near a standard condition ($M = 9.85$, $SD = 2.09$) were not significantly lower than scores in the large N and away from a standard condition ($M = 10.6$, $SD = 3.01$), $t(56) = -1.06$, $p = .104$ (see Table 1). Despite these results failing to support the initial hypothesis, the findings are interesting as they suggests that when the highly competitive scenarios of both the Proximity to a Standard effect and N-effect are introduced concurrently, rather than boosting competitive motivation, they seem to hinder it.

2 two-way ANOVAs were carried out to determine if gender was a confounding variable. It was found that there was no significant gender by N-effect conditions interaction, $F(1, 108) = 3.06$, $p = .08$. There was also no main effect of gender on what scramble score, $F(1, 108) = .46$, $p = .50$. In the second two-way ANOVA, results showed that there was no significant gender by Proximity to a Standard condition interactions, $F(1, 108) = .70$, $p = .41$. These results indicate that gender is not a confounding variable.

Lastly, word scramble scores in each condition were tested for accuracy. This was done by taking the number of actual words generated by each participant and dividing that number with the total number of entries produced by the same individual. The small N and near a standard condition had an accuracy of 99.2%. The small N and away from a standard condition had an accuracy of 98.8%. The large N and near a standard condition had an accuracy of 99.5%. The large N and away from a standard condition had an accuracy of 98.4%. The accuracies of scores in all conditions are all similarly high which indicates that word scramble score accuracy is not a confounding variable.

Discussion

The key finding of this experiment is that when the highly competitive scenarios of both the Proximity to a Standard effect and N-effect are introduced concurrently, competitive motivation is significantly lesser than when the highly competitive scenario of each of the effects is presented alone. This finding seems counter-intuitive in the sense that one would expect competitive motivation to increase, even at a diminished rate, when more competitive scenarios of situational factors are introduced. To try to understand this decline in word scramble scores when both effects were present, one might have to view it in terms of too much competition affecting competitive performance rather than just motivation. This current study assumed a positive relationship between competitive motivation and performance. However, a recent meta-analysis based on several existing research studies on the competitive-performance relationship cast doubts on this positive relationship (Murayama & Elliot, 2012). Participants might actually be strongly motivated to compete but due to the influence of so much competitive arousal, their performance might have been negatively affected. This relationship between competitive motivation, competitive arousal, and performance, could be explained by a phenomenon known as the Yerkes-Dodson law.

The Yerkes-Dodson law describes how the level of arousal affects performance for both simple and difficult tasks (Broadhurst, 1957; Yerkes & Dodson, 1908). For simple tasks that require things such as focused attention or short-term memory, as arousal increases, performance on such tasks increases and continues at a high level even at high arousal states. However, in more difficult tasks that requires things such as long term memory and decision-making, performance on such tasks increase with an increase in arousal until a point after which further increase in arousal leads to a decline in performance (Broadhurst, 1957).

In this study, the word scramble task, despite it being a relative simple task to complete, requires the use of long term working memory as well as problem-solving skills to generate other words from the given word. As such, the task would be considered a more difficult task. In this case, the results of this study fit relatively nicely into the Yerkes-Dodson law. In the large N and away from a standard condition, competitive arousal is at a minimum. As such, participants in that condition are only slightly motivated to compete against their peers, leading to a relatively low average word scramble score.

In the small N and away from a standard condition as well as the large N and near a standard condition, the presence of the small N or close proximity to a standard respectively could have led to more competitive arousal. Thus, participants in these two conditions could have been more motivated to compete which could explain their significantly higher word scramble scores than the other conditions. This result could imply that the increase in arousal in these two conditions never reached the threshold beyond which any further increase in arousal led to decreased performance.

Lastly, in the small N and near to a standard condition, the level of competitive arousal could have been beyond the threshold where an increase in arousal leads to a decline in performance. Participants in this condition could have been very motivated to compete but the sheer amount of competitive arousal could have negatively affected their performance on the word scramble task. This potential explanation implies that besides merely studying the effects of competitive social comparison factors on competitive motivation and behavior, it is equally important to observe how arousal caused by competition could potentially be both beneficial and detrimental to performance.

Limitations

In terms of limitations, this current study might have certain issues with internal validity as the study was administered via an online survey. Due to the nature of the online survey, participants could complete it at any time before the deadline. As such, potential situational factors such as time of day, day of the week, period of the semester, state of mind, or even personal issues could affect or even potentially confound the results of the study.

This study might also be limited in its external validity. Participants were college students enrolled in an introductory level Psychology class. College students might have a level of competitiveness as well higher level mental skills compared to the general population. As such, results from studies based on competitiveness administered in a college setting might not be generalizable to the wider population.

Implications

The implications of these results on competition and performance pertain to many domains in society; including work, education, and sports. Competition in the workplace has its benefits, especially in increasing productivity. In a field experiment involving picking oranges, every participant group was subjected to three conditions in which picking the most oranges would result in a reward. These three conditions provided an individual reward, group reward, or competition between groups where the top group received a reward (Erev, Bornstein & Galili, 1993). It was observed that compared to the individual reward, the group reward condition led to a 30% drop in production. This was described as “free-riding” or “social loafing”, where people put in less effort when they work in groups (Erev et al., 1993). However, results from the competition between groups condition removed the decline in productivity. This suggests that competition in the workplace is beneficial as it helps to combat social loafing.

However, too much competition in the workplace might be detrimental to worker well-being as well as performance. In a study conducted with IT professionals, survey results showed that a competitive workplace environment was related to higher stress levels in workers (Fletcher, Major & Davis, 2008). Although this study did not find any associations between a competitive environment and reported work performance, it is still important to realize that competition leads to stress which might in turn negatively affect performance in the long run.

Studies have shown that competition in the education domain has both pros and cons in terms of school performance. In a study carried out in secondary schools in England, it was observed that the more competition there was between schools, the better the examination performance and attendance rates (Bradley, Johnes & Millington, 2001). However, in a study that measured cognitive test anxiety and test performance in undergraduates, it was observed that higher anxiety was associated with lower scores in the three examinations used to measure performance (Cassady & Johnson, 2002). Coupled with the results from another study that showed that pressurizing and competitive environments are associated with anxiety (Colligan & Higgins, 2008), too much competition and arousal in schools could possibly lead to higher anxiety and poorer academic performance by students.

Lastly, in the domain of sports, research has been conducted to determine the relationship between competition in sports and athlete performance. In a meta-analysis conducted to determine the effects of competition on motor performance, it was determined that cooperation rather than competition led to better motor performance (Stanne, Johnson & Johnson, 1999). Another study that observed young athletes at a European Youth Olympic festival noted that the sheer amount of competition at the event was staggering and many athletes required support from social networks such as coaches and fellow athletes to cope with the competitive

atmosphere (Kristiansen & Roberts, 2010). It is important to note that a large portion of the domain of sports revolves around competitions. As such, findings in this current study coupled with those of the above mentioned studies might imply that in a competitive sporting atmosphere, an extremely competitive environment might be detrimental to athlete performance. Thus, it is important for athletes to manage this overwhelming competitive environment through means such as social support (Kristiansen & Roberts, 2010).

Future Directions

Further research in this topic of social comparison factors on competitive motivation should include detailed ways of measuring arousal of participants within conditions as situational factors are varied. This would provide more insight into how the Yerkes-Dodson law and arousal fits into the interaction between social comparison factors and competitive motivation. Despite this current study finding no significant difference in influence of the N-effect and Proximity to a Standard effect on competitive motivation, arousal and performance in a social setting, future studies should still be carried out to determine if there are any significant differences in influence in similar or various other settings. It is also interesting to determine if other situational factors such as Social Category Lines could have significant differences in influence compared to the N-effect and the Proximity to a Standard Effect.

Moreover, in other studies on the N-effect, the small N was typically around 10 competitors while the large N was around 100 competitors. However, due to the nature of the experiment where participants were deceived into believing that they were competing with fellow participants from a relatively small subject pool, a smaller scale of 3 other competitors (small N) and 15 other competitors (large N) was adopted to make the manipulations more believable. Thus, future studies should determine if similar findings could be replicated in larger

scale studies on the N-effect. Lastly, studies should be conducted to further test the interactions between the N-effect and the Proximity to a Standard. This will determine if the findings in this paper that the presence of both effects decreased performance in a competitive task can be replicated in similar as well as various other settings and societal domains.

References

- Bradley, S., Johnes, G., & Millington, J. (2001). The effect of competition on the efficiency of secondary schools in England. *European Journal of Operational Research*, 135(3), 545–568.
- Broadhurst, P. L. (1957). Emotionality and the Yerkes-Dodson law. *Journal of Experimental Psychology*, 54(5), 345-352.
- Cassady, J. C., & Johnson, R. E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology*, 27(2), 270–295.
- Colligan, T. W., & Higgins, E. M. (2006). Workplace stress: Etiology and consequences. *Journal of Workplace Behavioral Health*, 21(2), 89-97.
- Erev, I., Bornstein, G., & Galili, R. (1993). Constructive intergroup competition as a solution to the free rider problem: A field experiment. *Journal of Experimental Social Psychology*, 29(6), 463–478.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7, 117-140.
- Fletcher, T. D., Major, D. A., & Davis, D. D. (2008). The interactive relationship of competitive climate and trait competitiveness with workplace attitudes, stress, and performance. *Journal of Organizational Behavior*, 29(7), 899-922.
- Garcia, S. M., & Tor, A. (2009). The N-Effect: More competitors, less competition. *Psychology Science*, 20, 871-877.
- Garcia, S. M., Tor, A., & Gonzalez, R. D. (2006). Ranks and rivals: A theory of competition. *Personality and Social Psychology Bulletin*, 32, 970-982.

- Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76*, 129-142.
- Kristiansen, E., & Roberts, G. C. (2010). Young elite athletes and social support: coping with competitive and organizational stress in “Olympic” competition. *Scandinavian Journal of Medicine & Science in Sports, 20*(4), 686–695.
- Murayama, K., & Elliot, A. J. (2012). The competition–performance relation: A meta-analytic review and test of the opposing processes model of competition and performance. *Psychology Bulletin, 138*(6), 1035-1070.
- Poortvliet, P. M., Janssen, O., Van Yperen, N. W., & Van de Vliert, E. (2009). Low ranks make the difference: How achievement goals and ranking information affect cooperation intentions. *Journal of Experimental Social Psychology, 45*, 1144-1147.
- Porter, M. E. (1979). How competitive forces shape strategy. *Harvard Business Review, March/April*, 91-101.
- Stanne, M. B., Johnson, D. W., & Johnson, R. T. (1999). Does competition enhance or inhibit motor performance: A meta-analysis. *Psychology Bulletin, 125*(1), 133-154.
- Vandegrift, D., & Holaday, B. (2012). Competitive behavior: Tests of the n-effect and proximity to a standard. *Journal of Neuroscience, Psychology, and Economics, 5*(3), 182-192.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology, 18*, 459-482.

Table 1

2 x 2 Research Design

<u>Proximity to a Ranking Standard</u>		
N	Near a standard	Away from a standard
Small	Rank #2 vying for #1, 3 competitors	Rank #35 vying for #34, 3 competitors
Large	Rank #2 vying for #1, 15 competitors	Rank #35 vying for #34, 15 competitors

Appendix

16-question Multiple Choice Quiz

1. How many sides does a square have?
 - a. 3
 - b. 4
 - c. 5

2. Who is the current President of the University of Michigan?
 - a. John Michael Monroe
 - b. Stephanie Mary Smith
 - c. Mary Sue Coleman

3. What is 3×5 ?
 - a. 12
 - b. 14
 - c. 15

4. What is the nickname of the Michigan Football Stadium?
 - a. The Blue House
 - b. The Big Place
 - c. The Big House

5. Who delivers mail?
 - a. Teacher
 - b. Artist
 - c. Postman

6. Which of the following can fly?
 - a. Bird
 - b. Pig
 - c. Dog

7. Which school is Michigan's main rival?
 - a. Stanford
 - b. Colorado State
 - c. Ohio State

8. Which of the following is NOT a human sense?
 - a. Smell
 - b. Touch
 - c. Sleep

9. Which of the following is a sea animal?
 - a. Elephant
 - b. Whale
 - c. Giraffe

10. Which city is the University of Michigan in?
 - a. Ann Arbor
 - b. Los Angeles
 - c. New York

11. What is $8 + 4$ equals to?

- a. 10
- b. 15
- c. 12

12. Who flies planes?

- a. Doctor
- b. Postman
- c. Pilot

13. What are the University of Michigan Colors?

- a. Blue and Green
- b. Maize and Blue
- c. Yellow and Green

14. Who do you go to when you are ill?

- a. Doctor
- b. Gardener
- c. Driver

15. How many sides does a triangle have?

- a. 4
- b. 3
- c. 6

16. Which of the following is NOT a winter sport?

- a. Snowboarding
- b. Surfing
- c. Skiing

Answers

1. B

2. C

3. C

4. C

5. C

6. A

7. C

8. C

9. B

10. A

11. C

12. C

13. B

14. A

15. B

16. B