

The N-Effect and the Size of the Competitive Venue

by

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Abstract

Garcia and Tor's (2009) research discovered the N-effect, which is the finding that increasing the number of competitors (N) can decrease competitive motivation. Through 5 different studies, Garcia and Tor found that an increase in the number of competitors can affect one's competitive motivation even if the chances of success are held constant. Carino (2011) found that the N-Effect is the result of one's subjective judgment of the number of competitors. Though the absolute number of competitors was constant across conditions, Carino found that individuals who faced fewer competitors than expected performed significantly better than individuals who faced more competitors than expected. The size of the venue is another factor (like expectations) that can create the subjective experience of facing few or many competitors, independent of the actual number of competitors. This paper examines the impact of the size of the competitive venue on one's subjective judgment of the number of competitors and how changing the size of the venue impacts competitive motivation. Study 1 found that individuals viewing of a photo of small room vs. a large room were not affected by venue size, perhaps because it is difficult to give a participant a sense of the size of a room in a hypothetical scenario. Study 2 studied the N-Effect and the size of the venue in a real-world competition scenario. Results showed that participants in the large classroom performed significantly better than participants in a small classroom. Implications for education and test taking are discussed.

Keywords: N-effect, competition, competitors, subjective experience, motivation, performance, venue size

The N-Effect and the Size of the Competitive Venue

Hypothesis I of Festinger's (1954) Theory of Social Comparison Processes asserts that "there exists, in the human organism, a drive to evaluate his opinions and his abilities" (p. 117). Festinger suggests that humans have a basic drive toward self-evaluation that is based on comparisons with others. Festinger argued that when there is not an objective way for individuals to evaluate their own abilities (such as known class rank), then people turn to social comparison. While this hypothesis has instigated much research in the field of social psychology on social comparison, as well as on comparison as a source for competitive motivation, Festinger was not the first psychologist to study the effects of social comparison.

In 1898, Norman Triplett published research on a theory of competition. Inspired by bicycle racers who increased their speed when accompanied by a pacemaker, Triplett (1898) asked children to turn a fishing pole handle as quickly as possible either alone or in the presence of a competitor. Triplett found that those in the presence of a competitor turned the wheel faster than those who performed alone. He attributed the increased speed of performance in the presence of others to the release of latent energy not available when acting alone.

Following Triplett's research, Floyd Allport (1920) replicated Triplett's finding of increased performance in the presence of others. Unlike Triplett's research on competitors, Allport studied individuals working with co-actors, others who are simultaneously performing the task but not competing. Allport had participants complete free chain association tasks either alone or in the presence of a co-working group. Overall, Allport found that those working in a group showed an increase in speed but a lower quality of work. Additionally, the beneficial influence of working in a group was greater for motor and mechanical tasks, such as writing each word association, than in more cognitive tasks such as writing only every third word. Despite

these differences, Allport broadened the scope of Triplett's research by replicating the findings in cognitive tasks rather than simply repetitive physical tasks and by extending Triplett's findings for competitors to co-actors. In analyzing the results, Allport was the first psychologist to refer to these effects as 'social facilitation'. When reflecting on the influence of co-actors on speed, Allport described two contradictory factors. The first, an impeding influence, refers to distraction and self-evaluation that occurs when one works within a group setting. The second and stronger factor he deemed facilitation, in which the rapid work of a group member drives greater effort on the part of the individual.

Furthering social facilitation research, Dashiell (1930) aimed to distinguish between working alone, working in the presence of simultaneously participating co-actors, working against competitors in a rivalry situation and working under the observation of passive observers. In a fascinating contribution to social facilitation research, Dashiell (1930) found that quiet observers facilitate the speed of an individual over the speed of those working alone, though again at the expense of accuracy. Unlike earlier findings, Dashiell found no effect on speed or accuracy of performance in the presence of co-actors but he did find that direct competition facilitated the second fastest performance times. In studying different forms of social presence, Dashiell (1930) proposed that even individuals working alone may feel rivalry to a degree if they are aware that others are simultaneously completing the task out of sight in another room.

Deviating from previous findings of the facilitation of spectators in well-learned tasks, Joseph Pessin (1933) found that learning is more efficient when alone than in the presence of a spectator. Pessin's subjects were placed in one of three conditions to learn a list of nonsense syllables: control, mechanical or social. In the control condition, participants learned the list alone and undisturbed. In the mechanical condition, participants worked with visual and auditory

stimulation and in the social condition, participants worked in the presence of a passive spectator. Pessin found that learning was best in the control condition when participants were not distracted by other stimuli and that both time and accuracy were significantly poorer in the presence of a spectator. Interestingly, Pessin did find that retention of the nonsense syllables was better for those participants in the experimental conditions after one day and after three days. While Pessin's findings contradict the previous findings that spectators and competitors facilitate performance, it is difficult to make broad statements about social facilitation as much of the research differed in the both the type of social stimulus and in the type of activity studied. Pessin's differing results may be linked to the study of the memory process; Pessin posits that tasks involving speed are aided in the presence of others while more complex cognitive tasks suffer in a group setting.

In order to merge these outwardly contradictory findings, activation theories were developed. In 1965, Robert Zajonc developed his *generalized drive hypothesis*, which postulates that the mere presence of others can increase drive and activation in the individual performing the task (the actor). Zajonc argued that a well-learned response is facilitated by the presence of spectators, while the acquisition of new responses is impaired by the presence of others. Zajonc referred to learned responses as dominant responses. In other words, if the dominant response is the correct response on a task, then the presence of others is beneficial to performance, but if the dominant response is incorrect, the presence of others will facilitate the incorrect response. In applying his generalized drive hypothesis to past findings, Zajonc (1965) asserts that the tasks used by Allport (1920) and Dashiell (1930) fall under the "learned" category while the more cognitive tasks used by Pessin (1933) are "un-learned" tasks in which the dominant response would be incorrect.

Shortly following Zajonc's (1965) activation theory, Henchy and Glass (1968) published findings questioning that the mere presence of spectators enhances the emission of dominant responses. Henchy and Glass found that the emission of dominant responses was higher for subjects who were concerned that their performance was being evaluated, as compared to those participants who worked alone or in the presence of a non-evaluating audience. These results were further generalized by Cottrell and colleagues (1968) who studied performance on a pseudorecognition task. They found that drive and the emission of dominant responses increased in the presence of an audience but not in the mere presence of spectators who were uninterested in watching the subject complete the task and could not see the task stimuli. Furthermore, in their learned drive hypothesis, Cottrell and colleagues (1968) postulated that activation increases when actors simply associate an audience with performance evaluation not when they actively fear positive or negative evaluation.

Since the late 1970s, alternative explanations have shifted to attention theories, as well as other models focusing on self-presentation (Strauss, 2002). Sanders and colleagues (1978) found no support for Zajonc's or Cottrell's hypotheses. Instead, they assert a distraction-conflict hypothesis which postulates that any drive effects previously discussed in social facilitation research are due to distraction. They posit that any stimulus that distracts a subject from a task, such as the presence of spectators, prevents a subject from focusing fully on the task at hand. This distraction is coupled with an increase in arousal, which is due to the attentional conflict of focusing on both the task and the audience. The co-occurring distraction and arousal will disrupt performance on complex tasks but can facilitate completion of simple tasks when the level of arousal is greater than the hindrance of the distraction. Sanders and colleagues' (1978) distraction-conflict hypothesis further asserts that increases in drive produced by the presence of

others is due to the tendency for actors to shift attention away from a task when there is the opportunity to obtain social comparison information from coactors or an audience. Individuals wish to gain information about the adequacy of their performance by either comparing their performance to that of a coactor or to an audience's opinion of their performance. Sanders and colleagues' research indicates that social facilitation effects, recognized as improved performance on simple tasks and impaired performance on complex tasks in the presence of others, occur only when actors are motivated to obtain social comparison information and when that information is available; they believe this finding further disproves Zajonc's "mere presence" theory in that social comparison information is not available with spectators who are merely present but not engaged in watching the subject.

Baron's (1986) overload hypothesis modified the distraction-conflict theory by asserting that the conflict between attending to spectators and coping with distraction does not lead to increased arousal but rather leads to an exhaustion of attentional capacity. For complex tasks, this cognitive overload leads to decreased performance. On simpler tasks, however, the cognitive overload actually aids the subject by allowing them to ignore irrelevant stimuli meant to distract from the correct solution, which ultimately leads to an increase in performance.

Since Triplett's original findings in the effects of social facilitation, the number of theories analyzing the phenomenon has grown extensively. Bond's (1982) self-presentation model postulates that actors simultaneously aim to appear competent in the presence of others and deduce whether a task will be simple or difficult. If easy, actors reason that they can continue to appear competent by improving performance. If the task is difficult, Bond (1982) suggests that actors will conclude that they are unable to appear competent due to the nature of the task and will then experience embarrassment and performance decrements.

Social Comparison and Social Facilitation

Festinger (1954) expanded the scope of social facilitation research by connecting the processes of social influence and competitive behavior. He asserts that both processes stem from a drive for self-evaluation, thus pointing to competitive behavior as a consequence of social comparison. Tesser's (1988) self evaluation maintenance model postulates that the competitive behavior of a subject depends on the importance of the domain of comparison, as well as on the perceived psychological closeness of the competitor. According to the Related Attributes Hypothesis (Goethals & Darley, 1977), the commensurability of a competitor to an actor affects competition in that a commensurate competitor fosters greater competition. Another variable that impacts competitive behavior is the closeness of a competitor. When a domain of comparison is relevant to both the subject and the competitor, the competition will increase more among acquainted individuals than unacquainted individuals (Jones & Rachlin, 2006). In applying the findings that connect social comparison and performance, Johnson and Stapel (2007) found that individuals faced with upward social comparisons who feel a threat to self-regard respond to the threat with an increase in performance. Conversely, when the upward comparison targets boosted self-evaluation, the performance of the subject did not increase, which indicates that performance boosts are due to threats to self-regard.

Garcia, Tor and Gonzalez (2006) found that the degree of competition between competitors depends on their proximity to a meaningful standard. In the first three studies, they found that commensurate individuals are more competitive and less willing to maximize joint gains when they are highly ranked on a scale than when they are not. For example, individuals ranked #1 and #2 out of 500 are more likely to increase competition with each other than rivals ranked #203 and #204 due to their proximity to the top. More generally, studies 4-6 show that

commensurate rivals intensify competition on a relevant dimension when they are in the proximity of a meaningful standard; this includes rivals on the bottom of a ranking scale or those near a qualitative intermediate threshold. Studies 7 and 8 found that the proximity to a standard elicits the basic unidirectional drive upward (Festinger, 1954) beyond the effects of commensurability and dimension relevance. Garcia and Tor (2007) sought to understand the differences in social comparison on a task versus social comparison on a more general scale. They found that comparison on a scale is the main facilitator of competitive motivation.

The N-Effect

Garcia and Tor (2009) continued research into factors influencing competitive motivation by exploring how the number of competitors can impact social comparison and competition. The N-effect (Garcia & Tor, 2009) is the discovery that increasing the number of competitors (N) decreases competitive motivation. As past research has shown, social comparison fuels competitive motivation and behavior (Festinger, 1954), however past social facilitation research has typically examined the performance of an individual who is alone vs. an individual in the presence of a few competitors (Zajonc, 1965). Garcia and Tor's (2009) research examines the effect on performance when one competes against many others. Unlike past social facilitation research, the N-effect occurs in already competitive scenarios in which the effect of a few competitors is compared to the effect of many competitors, rather than studying the effect of one completing a task alone vs. in the presence of a few coactors. Through a series of five studies, they found that when competing against a few competitors, actors will socially compare and thus fuel their competitive motivation. However, when N is large it becomes more difficult for actors to socially compare and due to the greater number of competitors, it becomes less informative for actors to compare themselves with the multitude of targets. As a result, social comparison loses

importance in large N environments and competitive motivation diminishes. Additionally, Garcia and Tor (2009) found that the knowledge of the number of competitors can affect competitive motivation even when the chances of success remain constant.

The N-Effect and Expectations

Expanding on the discovery of the N-effect, Carino (2011) examined whether one's competitive motivation and performance are impacted by one's construal of the number of competitors one is facing independent of the absolute number of competitors. In a two-part study, Carino (2011) found that the impact of one's expectations of the number of competitors affects competitive motivation and performance. In the first study, those who encountered more competitors than they expected reported lower competitive motivation than those who encountered fewer competitors than expected, though the number of competitors was the same across conditions. Study 2 replicated these findings for most participants in a real world competition scenario. Again, the number of competitors was the identical across conditions, yet one's expectations impacted competitive motivation and performance. The findings confirm that the N-effect is not solely the result of the absolute number of competitors present but rather is the result of one's subjective judgments. Though there was the same number of competitors across conditions, participants *felt* as if they were competing against more or less people depending entirely on what their expectations were.

Current Research

The current research seeks to examine how another factor, the size of the competitive venue, can impact one's subjective experience of the number of competitors in a competitive situation independent of the actual number of competitors. Imagine Steve and John are both taking an exam for their Intro Psychology course. They are both taking the test in rooms with 30

other students. Steve takes the exam in a large auditorium, where him and his competitors are more spread out. The room feels relatively empty giving Steve the subjective impression that there are fewer competitors in the room. Conversely, John is taking the exam in a small room with a capacity for only 30 people where the competitors are seated closer together. In this cramped room, John has the subjective experience that he is competing against more people. While the absolute number of competitors is identical in both situations, the differing size of the testing venues changes the subjective experiences of Steve and John.

The current research will test the hypothesis that the size of the competitive venue can impact the subjective experience of competing against few or many competitors. We hypothesize that individuals competing in a smaller venue will *feel* they are competing against more people and show lower competitive motivation and poorer performance as compared to individuals competing in a larger venue.

Study 1: Hypothetical Venue Size and Competitive Motivation

Study 1 examines the impact of the competitive venue on competitive motivation in a hypothetical scenario. This study will test the hypothesis that the size of the competitive venue influences competitive motivation such that those who compete in a larger venue judge that they are competing against fewer competitors and will report greater competitive motivation than those who compete in a smaller venue and judge that they are competing against more competitors.

Method

Participants

Sixty-one participants (41 females, 20 males) were selected from the University of Michigan Intro Psychology Subject Pool. Participants completed an online Qualtrics survey in

the lab in exchange for subject pool credit. Participant age ranged from 18 to 24 years ($M = 18.89$).

Procedure

Participants were randomly assigned to one of two conditions: *large venue* and *small venue*. Participants were shown one of two images. Both pictures depicted a group of 15 students in a classroom taking an exam. The images shown were taken in the same venue in order to reduce variability but the students posed differently to give the impression of a large venue (Appendix A) versus a small venue (Appendix B). For the *large venue* condition image, the students were spread far apart across the room to give the impression of a larger space whereas the *small venue* condition saw the students grouped tightly together to give the impression of a small classroom setting. The images were followed by these instructions: “Imagine that, as part of a psych experiment, you are taking a standardized test (similar to the GRE) in the setting pictured above. You are taking the exam with students of a similar GPA to your own. When you signed up for the experiment you were told that those finishing in the top 10% on the standardized test would receive a \$500 prize.” Both conditions were then asked to respond to the same four questions: “During the test, to what extent would you try harder than you normally do on an exam?” (1 = *harder than normal*, 7 = *hardest in my life*), “In the end, how many competitors did you feel you were facing?” (1 = *not that many*, 7 = *quite a lot*), “How tough did you feel the competition in this scenario was?” (1 = *tougher than normal*, 7 = *Toughest in my life*), and “Where do you think you rank in your graduating class?” (A. top 5%, B. top 10%, C. top 25%, D. top 50%, E. top 75%).

Results and Discussion

After running a one way ANOVA controlling for perceived class rank, we found no significant effect of condition on expected effort, $F(1,58) = 1.48, p = .23$. The lack of effect based on venue size may be due to the hypothetical nature of the study. Unlike past research with expectations which may be easier to imagine in a hypothetical scenario, it may not be possible to give a participant a sense of venue size or crowdedness within a venue through a hypothetical test taking scenario.

Study 2: Venue Size, Competitive Behavior and Performance

While Study 1's examination of competitive motivation in a hypothetical scenario was unsuccessful in demonstrating differential competitive motivation based on venue size, Study 2 aims to examine the impact of venue size on competitive behavior and performance in a real-world competition.

Method

Participants

80 undergraduate students from the University of Michigan participated in this study in exchange for either course credit or monetary compensation. Only participants for whom English was their first language were included in the analyses. This resulted in 70 participants (54 females, 16 males).

Procedure

When participants arrived, they were directed into one of two classrooms, either large or small. The rooms chosen were extremely similar and were located right next to each other in the same building. Both rooms had bare walls and lacked windows. Additionally, both rooms featured the same desks, blackboards, and technological equipment. In both rooms, 20 desks

were set up in 4 rows, each with 5 desks. In the large room, with a capacity of 75, the desks were much more spread out across the room. Conversely, in the small room with a capacity of 30, the desks were much closer together and cramped. Participants were directed into the room and allowed to pick their own seats. When all participants were seated, they were told they would be competing against each other on two separate tasks, a scrabble task and a word search. They were told that those of them finishing in the top 20% on either task would receive a \$10 prize. On the blackboard there was a reminder stating: “Those of you finishing in the top 20% of people in this room on either task will receive a \$10 prize.”

Participants then completed a scrabble task three times. Each task had one of the following key words: BALCONY, KITCHEN, FURNITURE. Played according to the rules of scrabble, participants had one minute to write down as many new words as possible from the letters in the key words. New words had to be at least three letters long and could only use each available letter from the key word once. The dependent variable for this task was the total number of new words participants wrote down from the combined three trials. Following the three scrabble tasks, participants completed a word search activity. Participants were given 2 minutes to circle as many words as possible in a word search with sixteen hidden words. The dependent variable for this task was the total number of words circled in the word search. Lastly, the participants completed a questionnaire which included demographic questions and a measure of subjective judgment of the number of competitors (“In the end, how many competitors did you feel that you were facing?” *1 = not that many, 7 = quite a lot*) for each of the two tasks. Participants were also asked how often they play Scrabble (*1 = never, 7 = very often*) and how often they complete word searches (*1 = never, 7 = very often*).

Results

After running a one way ANOVA controlling for participant's reported scrabble experience, we found a marginally significant effect of condition on scrabble task performance, $F(1, 67) = 3.61, p = .06$. Participants in the large classroom condition ($M = 26.18, SD = 8.57$) generated marginally significantly more words than participants in the small classroom condition ($M = 22.78, SD = 6.75$) There was no effect of condition for the word search task, $F(1,67) = .60, p = .44$.

Discussion

As predicted, results show that participants in the large classroom performed better than participants in the small classroom on the scrabble task. These results provide additional support for Carino's (2011) theory that the N-effect is not dependent on the absolute number of competitors but can be manipulated by factors that affect one's subjective judgment of the number of competitors. The results showed no statistical significance for the word search task. Participants across conditions showed a floor effect in the word search task, meaning that there was little variability in results across conditions because all participants performed poorly on the task.

General Discussion

While social facilitation research has a lengthy history, research into the N-Effect is still in early stages. The N-Effect (Garcia & Tor, 2009) has shown that competitive drive and motivation decreases when a subject is faced with a high number of competitors, rather than a just a few observers, co-actors or competitors. Carino's (2011) research on expectations proved that the N-effect is result of one's subjective experience. The current research presented two studies that attempted to demonstrate that venue size, another factor like expectations, can

influence one's subjective judgment of the actual number of competitors present. While Study 1 of a hypothetical test-taking scenario did not yield results, Study 2 showed the impact of venue size on competitive behavior and performance in a real-world competition. Though the actual number of competitors was constant, participants in the large venue performed better as a result of their subjective experience of competing against fewer competitors, whereas participants in the smaller venue showed poorer performance as a result of their subjective experience of competing against many competitors. There is still much to be learned about the intricacies of the N-effect and other factors that can impact subjective judgment in competitive scenarios.

Limitations

The results of this research could have benefited from having more power. There are a few possible explanations for the lack of power. First, the results could have been strengthened by the inclusion of more data. Second, it is possible that the word search task was too difficult and with low performance across conditions, it is difficult to see the true effect of venue size for this task. Finally, this research may have benefited from utilizing the Social Comparison Orientation (SCO) Scale (Gibbons & Buunk, 1999) which measures an individual's tendency to socially compare in their everyday life. Garcia and Tor (2009) showed that individuals who have a higher tendency to socially compare may be more susceptible to the N-effect than those who make fewer social comparisons. It may have been helpful to know how many of our participants had uncertain self-concepts to better evaluate how interested they were in social comparison (Gibbons & Buunk, 1999). It is possible that the effect of people high in social comparison was diluted by those participants low in social comparison. If we had been able to control for social comparison orientation, the effect of venue size on effort and performance could have had higher power.

Classroom Size, Testing Venues and Educational Implications

The research on the N-effect has significant implications for education, specifically in classrooms and testing situations. Two economists, Hanushek and Krueger, have debated the merits of smaller class sizes (Mishel & Rothstein, 2002). Hanushek (2002) argues that reducing the number of children in the classroom shows no discernable effects of student achievement and that instead, schools should be focusing on teacher quality as a more significant indicator of student success. Conversely, Krueger (2002) argues that a smaller student to teacher ratio is positively related to performance. While the debate continues, Garcia and Tor's (2009) research on the N-effect implies that as the number of students increases, their motivation and performance will decrease. The research presented above suggests that the size of the room also has an effect on a student's subjective judgment of the number of competitors they are facing. As national class sizes continue to grow each year, we may continue to see achievement rates drop. If so, perhaps schools can move the largest classes into bigger classrooms to help children lower the impact of larger class numbers on their achievement.

In study 1a of The N-Effect research, Garcia and Tor (2009) found that the more students on average in a venue, the lower the SAT score. The current research posits that the size of the testing venue may also have an effect on the scores of the students. At busy testing sites where many students may be put into small rooms, those students may be at a disadvantage for lower competitive motivation and poorer performance than students in less densely populated areas. While Garcia and Tor's (2009) research indicates that the number of students in each testing room should be constant to avoid the damaging effects of the N-effect for any students facing more competitors, the present research suggests that smaller rooms should have less students to

ensure that the subjective judgment of students testing in the smaller rooms is not skewed to think they are facing more competitors.

Future Studies

In addition to running more participants in the current research to see if the power increases with more data, future studies could benefit from examining the possible variability in the N-effect across different scenarios. For instance, is the N-effect strongest in a testing environment where competition is incredibly salient or is it equally pronounced in a yearlong classroom situation? Is it possible that children in a classroom with many other students adapt to the number of competitors they are facing over the course of the year? Drawing on the present research, if large classes are put into larger venues to diffuse the negative outcome of the N-effect on performance, do students ultimately acclimate to the size of the room and then fixate on the number of competitors they are facing if the competitive scenario is a full school year and not just a testing situation such as the SAT?

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Appendix A



Appendix B

