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# **THE EFFECT OF STEREOTYPE ON COGNITIVE PERFORMANCE: AN EXPERIMENTAL STUDY OF FEMALE COGNITIVE PERFORMANCE**

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## **Abstract**

This study investigated the effect stereotypes have on cognitive performance. A between-subjects experimental design was utilized in the study. Forty participants from the senior secondary two (SS2) of Chapel Secondary School Ilorin took part in the study, and their cognitive performance in the light of exposure to a stereotype was measured. Four hypotheses were tested. Using the t-test for independent samples, the findings of the experiment showed that males performed better than females on a mathematics test when exposed to stereotype ( $t=2.688$ ,  $df=18$ ,  $p<0.05$ ). The study also found that males who were exposed to stereotype performed better than males who were not exposed to stereotype ( $t=2.998$ ,  $df=18$ ,  $p<0.05$ ). However, there was no significant difference in the performance of females who were exposed to stereotype and those who were not ( $t=2.740$ ,  $df=18$ ,  $p>0.05$ ). Stereotypes have been identified to affect the way people see things and the way they interpret certain behaviours of other individuals or groups. Therefore understanding the nature of stereotypes, prejudice, and discrimination is the first step in combating these practices.

## **Introduction**

One of the human mind's most complex functions is the governance of a person's social behaviour. One aspect of this function is storing information about other people in order to interact with them or predict their behaviour. The brain has developed mechanisms that group data based on similarities. While this storage system assists

with organization and use of the stored information, it can have the side effect of associating characteristics with subjects for which the association may be inaccurate. This generalization, specifically as it applies to humans, is known as stereotyping.

"A stereotype is a socially shared set of beliefs about traits that are characteristic of members of a social category" (Greenwald & Banaji, 1995).

Cognitive abilities are not the only mental determinants of how well people perform on intellectual and academic measures. Beliefs are also important. Our beliefs about other capabilities of man can affect how we respond to them. For example, it has been shown that if teachers are told that a particular student has hidden potentials or alternatively has intellectual limitations, they may increase or decrease the amount of attention and effort expended on that child thereby influencing the child's development of cognitive skills.

Certainly, human social interaction has been a major subject of psychological research. The brain has developed mechanisms that help humans interact effectively and efficiently. Some of these mechanisms serve to permit one person to predict a target person's behaviours or characteristics. These predictions are often made based on physical characteristics and the social group in which the target implicitly belongs which is commonly called stereotyping. Unfortunately, these stereotypes do not always accurately reflect the individual and this can result in discrimination, sexism, and racism. A "stereotype" is a generalization about a person or group of persons. We develop stereotypes when we are unable or unwilling to obtain all of the information we would need to make fair judgments about people or situations. In the absence of the "total picture," stereotypes in many cases allow us to "fill in the blanks." Our society often innocently creates and perpetuates stereotypes, but these stereotypes often lead to unfair discrimination and persecution when they are unfavourable. For example, if we are walking through an open avenue late at night and encounter three senior citizens wearing t-shirts and walking with canes, we may not feel as threatened as if we were met by three high school-aged boys wearing leather jackets. Why is this so? We have made a generalization in each case. These generalizations have their roots in experiences we have had ourselves, read about in books and magazines, seen in movies or television, or have had related to us by friends and family. In many cases, these stereotypical generalizations are reasonably accurate. Yet, in virtually

every case, we are resorting to prejudice by ascribing characteristics about a person based on a stereotype, without knowledge of the total facts. By stereotyping, we assume that a person or group has certain characteristics. Quite often, we have stereotypes about persons who are members of groups with which we have not had firsthand contact.

Television, books, comic strips, and movies are all abundant sources of stereotyped characters. For much of its history, the movie industry portrayed African-Americans as being unintelligent, lazy, or violence-prone. As a result of viewing these stereotyped pictures of African-Americans, for example, prejudice against African Americans has been encouraged.

Stereotypes also evolve out of fear of persons from minority groups. For example, many people have the view of a person with mental illness as someone who is violence-prone. This conflicts with statistical data, which indicate that persons with mental illnesses tend to be no more prone to violence than the general population. Perhaps the few, but well-publicized, isolated cases of mentally ill persons going on rampages have planted the seed of this myth about these persons. This may be how some stereotypes developed in the first place; a series of isolated behaviours by a member of a group which was unfairly generalized and viewed as a character of all members of that group. Stereotypes could play a role in affecting an individual's cognitive process in many areas such as in judgements, intellectual performance, proper and fair situation appraisal, etc.

Stereotypes about different groups in society are virtually unavoidable. These overgeneralizations are shared throughout the culture and are known by the overwhelming majority of its members, regardless of their personal endorsement of the particular stereotype. Outward aspects of individuals such as age, race, or sex can activate stereotypes (Devine, 1989), but once a stereotype has been activated, it is not inevitable that it will be used to determine future actions. The perceiver's personal feelings of prejudice will decide if the stereotype will be applied to the current situation and the individual. Prejudiced individuals will allow their behavior to be directed by the stereotype, whereas unprejudiced individuals will not be influenced (Devine, Monteith, Zuwerink, & Elliot, 1991).

Steele's (1992) work on stereotype vulnerability demonstrates that expectations may have drastic effects on performance. In a series of

creative experimental studies, Steele and his colleagues have shown that when subjects performing challenging tasks are aware that their ability is being gauged in a domain in which members of the subjects' group are generally thought to perform poorly, they feel anxious about confirming or being judged by the stereotype, and their anxiety interferes with their performance. He calls this condition of anxiety "stereotype vulnerability." He believes that students who are stereotype vulnerable tend to disengage from work in the anxiety-provoking domain to avoid ego assaults that may cause them to feel helplessly incapable.

In his research on stereotype vulnerability, Steele (1997) found that when equally able male and female students took a difficult English test, they performed equally, but when equally able male and female students took a difficult math test, the female students performed significantly less as well than the male students. He hypothesizes that because the test was difficult, the female students experienced some frustration, lending support to stereotypes about their ability and arousing anxiety about confirming such stereotypes. In a subsequent study, when equally able male and female students took a difficult math test after having been told that it is a test on which men and women perform equally, the male and female students had equal performance. In this case, he hypothesizes that the female participants did not invoke the stereotype to explain their frustration and were not anxious about confirming it. Similarly, black students performed less well than equally able white students on a challenging standardized test when told it was a measure of ability, but performed equally well when told performance was unrelated to ability. Steele and his colleagues also found that participants expecting to take the test, which measured ability exhibited greater stereotype activation, greater concern about their performance, and a greater reluctance to have their racial identity associated with their scores. Furthermore, Steele (1997) found that stereotype vulnerability could be induced by asking students to identify their races in a pre-test questionnaire, even when they had been told that the test was not a measure of ability.

Finally, Steele argues that stereotype vulnerability is a universal phenomenon and is not associated with any particular group. In one study, white males who had been told that Asians outperformed all other ethnic groups on a challenging math test performed less well than white males who had not been told that Asians performed better on the test.

Previous work has shown that the activation of negative stereotypes influences performance in members of the stereotyped group. Auman (2002) attempted to test the applicability of stereotype threat to middle-aged and older adults in a medical setting. Specifically, the assumption that stereotype threat occurs as a normal response to any conditions in which individuals feel that the potential to be stereotyped exists was examined. Based on the theory of stereotype threat proposed by Steele (1997), it was hypothesized that anxiety would increase and performance would decline when patient stereotypes were activated in outpatients at the VA clinic. To test this hypothesis, VA patients aged 46 to 86 years were interviewed in a manner designed to either heighten or reduce threat through reference to either their patient status or, conversely, some positive aspect of self. Participants' cardiovascular and galvanized skin conductance responses (GSR) were monitored throughout the study, and measures related to anxiety and performance outcomes were also completed. Stereotype-related variations in anxiety were evident, with patients who talked about their medical experiences reporting more feelings of anxiety than patients who were interviewed about their leisure activities. Additionally, patients who were asked about their medical experiences demonstrated greater changes in their GSR readings over the course of the experiment, suggestive of higher levels of stress. Potential explanations for these results are explored including those relating to the cognitive structures activated by the negative stereotypes associated with being a patient.

In an exploration of the effects of gender on performance, Brown and Josephs (1999) conducted a study. In their first experiment, they either told participants that the math test they were about to take would show whether they were weak in math, or whether they were strong. Consistent with the hypothesis that stereotype threat would affect women's performance, female participants who had been told that the test would determine whether they were weak in mathematics (the stereotype-consistent test description) performed worse than female participants who had been told that it would test whether they were strong in math. Men showed the opposite pattern. They performed better when they were told that the test measured math strength than when they were told that it measured math weakness. This indicates that the effects of gender-related math stereotypes can be positive or negative. Performance of members of a group that is negatively stereotyped is negatively affected by the

stereotype threat than the performance of members of the group that is positively stereotyped even when the stereotype is active.

Researchers have also examined the stereotype threat idea in groups other than African-Americans. Aronson, Lustina, Good, and Keough (1999) conducted research investigating whether a history of stigmatization was necessary for stereotype threat to occur and subsequently influence performance. In this case, White males were tested in math, a domain for which there was no negative stereotype about their group. However, by comparing the White males to Asian males, a group for which there is a very positive stereotype about math, these researchers were able to activate stereotype threat within them. White males by implying that they may confirm the stereotype that Americans of European descent have poorer math ability than Asian-Americans. The results supported the idea that a history of stigmatization was not necessary and that situational factors alone could cause stereotype threat to occur. This threat has the potential to prevent individuals from performing at their ability level in a domain that is important to them.

In one study, Keller (2002) used methods similar to those of Steele, James, and Barnett (2002), in which participants complete a math test either after having the gender stereotype primed or without having it primed. Consistent with the other research, he found that females (he used high school students) performed worse than men when the stereotype was active, but as well as men when it was not. He also found that the decrease in performance was largely due to self-handicapping, which is common in the face of stereotype threat. Self-handicapping involves things like decreased effort and attention, procrastination, and similar performance-reducing behaviours. In Keller's study, female participants for whom the stereotype was primed were much more likely to perform self-handicapping behaviours.

A separate set of studies by Steele and Aronson (1995) has examined ethnicity, stereotype threat, and performance of Black students compared with White students on standardized tests of achievement (verbal portion of the GRE). High stereotype threat was linked to a decreased verbal performance for high-achieving Black college students (Steele & Aronson, 1995, Study 1). Black participants did worse than white participants when the test was presented to Measure their verbal achievement, while they did as well when ability

was not made salient. The relationship between heightened stereotype threat and decreased test performance was replicated in another Study 2. Further, heightened stereotype threat was linked to an increase in thinking about the specific ethnic stereotype and increased self-doubts associated with it (Steele & Aronson, 1995, Study 3) for high-achieving college-age students. Black participants expecting to take a test of intellectual ability experienced concerns about ability, made more excuses about their performance, and showed a greater reluctance to have their ethnic identity linked to their test performance, suggesting this is due to stereotype threat. An even more subtle manipulation (no directions were given but students indicated their race on the cover page of the test) depressed Black participants' performance on a difficult verbal test (Steele & Aronson, 1995, Study 4).

Spencer, Steele, and Quinn (1999) administered quantitative ability items from the Graduate Management Admission Test to women and men undergraduates. Stereotype threat was manipulated by telling one group that there were no gender differences on the test (the low threat condition) and by telling the other group nothing about this topic (the high threat condition). Women's scores were lower in the high threat condition than in the low threat condition while men's scores were unaffected.

From all the various researches carried out by different researchers on their various perspectives, one can see that stereotype is a general cognitive process that occurs across the human race and is inevitable. But most of the researches carried out have been done majorly in the western world. All societies do not necessarily follow the way of life of the western culture. Therefore, there could be variations in the way stereotype affects cognitive process. The levels at which it affects cognitive process could vary across culture and also the stereotypes held across cultures.

Shih, Pittinsky, and Ambady (1999) investigated how stereotype salience could be manipulated and influence subsequent performance outcomes within individuals. Specifically, these researchers examined a group for which two differing stereotypes applied: Asian-American women. For this group, the positive stereotype about Asians' superior math ability is relevant, as well as the negative stereotype about females' poor math skills. This research suggested that intellectual performance can be moderated by the Social identity that is currently salient. The Asian-American women

who had their ethnic identity brought to mind prior to testing had better performance outcomes than a control group, whereas the Asian-American women who were prompted to think about their gender performed worse than a control group. Thus, differing stereotypes can apply to the same group of people and, depending upon the aspect of their identity that is brought to mind, influence cognitive performance in different ways.

Many experiments have tested how stereotypes affect the cognitive process, and this research goes a step further by experimenting amongst Nigerian youths to test how stereotypes affect the cognitive process of female students on mathematical performance.

### Hypotheses

The following hypotheses are tested in this study:

1. There will be a difference in performance between males and females exposed to stereotype.
2. Females who are not exposed to stereotype will have a better performance than females who are exposed to stereotype.
3. Males who are exposed to stereotype will have a better performance than males who are not exposed to stereotype.
4. Males who are exposed to stereotype will perform better than females who are not exposed to any form of stereotype.

### Methods

#### Design

**A between subjects experimental design was utilized in this study.**

#### Settings

The experiment for this study was carried out in the laboratory rooms of the Chapel Secondary School, Ilorin.

#### Instruments

The instruments used for the study includes: Mathematical tests material obtained from the past questions of the West African examination council (WAEC), 2005 and the new general mathematics for senior secondary two (SS2).

**Procedure:**

Forty participants from the Chapel Secondary School, Tanke, Ilorin, took part in this study. The forty participants were randomly divided into two groups: the experimental group and the control group. The experimental group consisted of ten males and ten females, and the control group had same. The experimental group was exposed to a form of stereotype about females' inability in mathematical test compared to that of the males who have better ability to perform well in mathematical test, while the control group was simply told to help in giving answer to a mathematical test material. The two groups, that is, the experimental group and the control group were given a mathematical test to work on for less than 17 minutes. After the time had elapsed, their scripts were retrieved from them, marked and scored by the researcher and their performances were measured and compared.

**Statistical analysis**

The student t-test for independent samples was used to analyze the hypotheses.

**Results**

**Hypothesis 1**

There will be a difference in performance between males and females exposed to stereotype.

**Table 1**

Summary Table showing the t-test analysis of the differences between males and females exposed to stereotype.

Participants	Mean	N	SD	t	df	Probability
Males exposed to stereotype	11.3	10	2.40601	2.688	18	P < 0.05
Females exposed to stereotype	8.2	10	2.74064		18	

As the table shows, there is a significant difference in the performance level of males and the females exposed to stereotype. This implies that the males who were exposed to the stereotype threat

(that the male sex have better mathematical abilities than females) performed better than the females who were also exposed to the stereotype threat (that females have lower mathematical abilities than males). This indicates that the exposure to stereotype had an effect on both males' and females' cognitive processes thereby affecting their performance in the mathematical test presented to them. Therefore the hypothesis stated above was accepted.

### Hypothesis 2

Females who are not exposed to stereotype will have a better performance than females who are exposed to stereotype.

**Table 2**

Summary Table showing the t-test analysis of the differences between females exposed to stereotype and females not exposed to stereotype.

Participants	Mean	N	SD	T	df	Probability
Females exposed to stereotype	8.2	10	2.74064	1.46	18	p>0.05
Females not exposed to stereotype	10.5	10	4.19656		18	

The table above shows that there is no significant difference in the performance of the females who were exposed to stereotype and the females who were not exposed to stereotype. Their performance in the mathematical test was relatively similar to each other; therefore the hypothesis was not sustained.

### Hypothesis 3

Males who are exposed to stereotype will have a better performance than males who are not exposed to stereotype.

**Table 3**

Summary Table showing the t-test analysis of the differences between males exposed to stereotype and males not exposed to stereotype.

Participants	Mean	N	SD	T	df	Probability
Males exposed to stereotype	11.3	10	2.054800	2.998	18	P<0.05
Males not exposed to stereotype	8.0	10	2.40601		18	

As shown in the above table, there is a significant difference in the performance of males who were exposed to stereotype and the males in the control group who were not exposed to stereotype. This shows that the males exposed to the stereotype threat (that males have better mathematical abilities than females) performed better than the males who were not exposed to the same stereotype. Therefore the research hypothesis was accepted.

**Hypothesis 4**

Males who are exposed to stereotype will perform better than females who are not exposed to any form of stereotype.

**Table 4**

Summary Table showing the t-test analysis of the differences between males exposed to stereotype and females not exposed to stereotype.

Participants	Mean	N	T	df	Probability
Females not exposed to stereotype	10.5	10	1.011	18	p>0.05
Males exposed to stereotype	11.3	10		18	

Males exposed to stereotype	11.3	10		18.	
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As the table shows, there is no significant difference in the performance of both males and females who were not exposed to stereotype and the males who were exposed to stereotype. The hypothesis is therefore rejected. Stereotypes exposure in males and females had no negative influence on performance when compared to females who were not exposed to stereotype. Males were always constant in the long held belief in them that no negative feelings affect them as it does females. Come what may, they are always regarded as performing better in mathematics than females.

**Discussion**

The results of the findings in this study show that people's awareness of an existing stereotype affects their way of thinking and their cognitive processes. This can be seen in the results of hypothesis 1 which states that males exposed to stereotype will perform better than females who were exposed to stereotype. This hypothesis was confirmed using the t-test statistical analysis. From the performance of the participants who were exposed to stereotype, there was a mean difference of 3.1 between the males and the females and this indicates a large difference in their performance. Also, the calculated t value was 2.688 and the critical t value was 1.734. The calculated t value was much higher than the critical t value which shows the high level of significant difference. This result indicates an effect of stereotype on cognitive process. When individuals develop stereotypes in their cognition, their thinking, perception and cognitive process is altered from the ideal way of thinking. This is supported with the result of hypothesis one and this result was also in line with the findings of Steele (1997) in his work on stereotype vulnerability. More so, because females are usually considered to be poorer in mathematics, the difference obtained in this study just confirms this belief empirically, thus fulfilling the self prophecy.

Table 2 showing the results which disconfirms hypothesis two indicate that females who were aware of stereotype threat did not

perform significantly poorer than the females who were not exposed to stereotype threat. The result obtained here could however be due to various reasons such as those peculiar to the individual and also the nature of the test. Females exposed to stereotypes could have performed based on self fulfilling prophesying. This implies that the females may not have made an attempt to do their best in the mathematical test since they were already told that females do not perform well in mathematics.

Table 3 shows that there was a significant difference in the performance of males who were exposed to stereotype and males who were not exposed to stereotype. There was a high mean difference 3.3. The calculated t value was 2.998 which was higher than the critical value of 1.734 at 0.05 level of significance. The implication could be that performance was based on the accepting the belief that anytime, males were always better than females in maths.

Table 4 however shows that there was no significant difference in the performance of all the males and females who were not exposed to stereotype and the males who were exposed to stereotype. In other words, regardless of the stereotype, males would always perform better than females who were not exposed to stereotype. The stigma would always be there and males would always be better than females.

From the results obtained in this study, it can be concluded that stereotype has a way of interfering with the cognitive process of an individual. A recent study using a think-aloud verbal protocol methodology indicated that during the examination, stereotype threat is associated with diminished capacity to generate strategies for solving difficult problems (Quinn & Spencer, 2001).

### **Implications of the study**

This study on stereotype shows that stereotypes have a way of affecting individuals' cognitive process one way or the other. Therefore, understanding the nature of stereotypes, prejudice, and discrimination is the first step in combating these practices. All of us have stereotypes about members of groups different from ourselves. We should, however, recognize that we are not acting fairly if we treat people differently because of these stereotypes and prejudices. Each one of us deserves to be considered a unique human being. We all face peer pressure when confronted with a joke which puts down a

certain minority. It takes courage to raise objections to these jokes and pejorative names and to actively fight the chauvinism and narrow-mindedness which they foster. It is important to stand up against injustice, fight discrimination and stereotypes which have served as the harbinger to persecution, violence, and in extreme cases, genocide.

### **Limitations of the study**

There were some limitations that occurred in the course of this research.

There was the problem of attending to the two groups which are the experimental and the control group at the same time. It would have been better that each group (experimental and control) was attended to by separate independent people who would have properly monitored the participants.

Also, there was fatigue on the part of the participants as the experiment was conducted after a full day's work at school.

### **Recommendation and Suggestions for further studies.**

This research focused on a particular type of stereotype. Therefore, it is recommended that further researches be carried out along this line to include more variables than those in this research work. Further researches should also be carried but focusing on younger individuals as well as older participants such as the aged.

Stereotype occurs as a result of classification. Only by understanding the source of the problem can society hope to resolve the issue. Stereotypes are viewed on television programs, parents pass on stereotypic beliefs about certain groups to their off-springs, and teacher-student relationship is affected by stereotypes held about students. In every area of society, stereotypes can be seen. It takes a conscious effort to try to stop the perspective we have about certain groups, people or individuals. We are all different, therefore we should look at every individual with the understanding of this. By this, stereotype can be reduced. Also, television shows should stop depicting individuals or group of individuals as having characteristics that may form stereotype. It is believed that categorization and stereotyping occur automatically, but can be controlled if given proper attention.

**Conclusions.**

The purpose of this research was to find out the effects of stereotypes on cognitive process. Using the experimental design it was observed that females who were exposed to stereotype about their poor ability to perform well in mathematics actually performed poorer than males who were also exposed to the stereotype that males have a better ability to perform better in mathematics. These stereotypes could be seen as dangerous beliefs which could mar an individual. Efforts should be consciously made to reduce these beliefs.

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