CHAPTER-III

PROBLEM AND HYPOTHESES

Choking, which is suboptimal performance of an individual, has been observed in varied areas. Students generally exhibit choking during examination because of examination anxiety and other related factors. Choking is suboptimal performance, not just poor performance. It is a performance that is inferior to what one can do and has done in the past. Everyone experiences performance ups and downs, but Choking occurs when the performer perceives a situation to be highly stressful. Research has demonstrated choking in diverse task domains (Golf: Beilock & Carr, 2001; Lewis & Lindes, 1997; Hockey: Ashford & Jackson, 2010; Modified basketball shooting task: Lam, Maxwell & Masters, 2009; Music: Wan & Huon, 2005; Mathematical problem solving: Beilock, Kulp, Holt & Carr, 2004), especially when optimal performance is linked with maximum incentives. Two main explanations have been put forth to explain choking. Distraction Theory suggests that performance pressure fills working memory with thoughts about the situation and its importance, that compete with the attention normally allocated to execution. Pressure serves to create a dual task environment in which controlling the execution of the task at hand and worries about performance via for the attentional capacity with were earlier devoted solely to primary task performance (Belliock & Carr, in Press, Lewis & Linder, 1997). Self-focus theory of explicit monitoring proposes that performance pressure increases anxiety and self-consciousness about performing correctly, which in turn enhances the attention paid to skill processes and their step by step control. Attention to performance at such a component-specific level is thought to disrupt the proceduralized or automated process of high level skills that normally run outside the scope of working memory during performance (Baumeister, 1984; Beliock & Car, 2001; Kimble & Perlmutter, 1970; Langer & Imber, 1979; Lewis & Linder, 1997, Masters, 1992). Thus, while distraction theories suggest that pressure creates a distracting environment that draws attention away from primary skill execution, explicit monitoring theories, on the other hand, suggest that pressure prompts too much attention to performance. Review of researches relating to the two theories has provided support for the explicit monitoring theories. Two major reasons have been put forth to explain the reason...
why the distracter theories are unable to account for the choking observed by the researchers. Firstly, the applicability of either of the two theories may be determined by the individual's skill level of the task. Performance decrement observed in novices may be accounted for by the distraction model while that of experienced performers by the explicit monitoring model (Beilock & Carr, 2001; Beilock, Bertenthal, McCoy & Carr, 2004; Beilock, Carr, MacMahon & Starkes, 2002; Gray, 2004; Lewis & Linder, 1997). Secondly, research on choking has mainly focus on performance of proceduralized sensory motor skills required in sports, which may not be susceptible to pressure induced failure via distraction (Fitts & Posner, 1967; Proctor & Dutta, 1995), as they are largely robust to decrements resulting from distracting, dual-task situations (Beilock, et al., 2002; Gray, 2004). However, for tasks that rely heavily on working memory for execution (e.g. Academic performance), performance decrements may result from anxiety induced worries and distraction theories might be a more likely candidate to explain the performance decrement observed with these kinds of skills when executed under pressure.

The working memory model (Baddele and Hitch, 1974) which is concerned with both the active processing and transient storage of information has been reported to play an important role in cognitive tasks (DeStefano & Le Fevre 2004). Processing capacities of the central executive and the storage capacities of the buffer systems are highly responses to arousal, where performance decrements have been reported as result of increase anxiety and pressure. (Fürst & Hitch 2000; Heathcote, 1994). Deficits observed in a number of cognitive processors such as selective attention, memory retrieval, or language processing (Dempster & Brainered, 1995; and Dagenbach & Carr, 1994), reflecting reduction in working memory capacity, have been attributed to inhibitory processors. However, researchers differ on the issue of whether inhibitory processors contribute to working memory capacity or vise versa (Engle 1996; Hasher and Zacks, 1988) giving rise to the chicken-egg dilemma.

Since, inhibition refers to an active suppression mechanism that prevents irrelevant information from disrupting cognitive processing; it seems rather unlikely that one single kind of mechanism would be responsible for all of them. In fact, several studies have shown that inhibition is not a unitary construct (Friedman & Miyake,
Redick, Heitz and Engle (2007) proposed measures of inhibition i.e. Access, which occurs at the perceptual stage, is considered as a process of interference control that prevents activated but goal irrelevant information from entering into Working Memory such that potentially appropriate responses can be considered. Deletion is a process which occurs after representations enter focus of attention. It is the effortful suppression of irrelevant information from working memory, such that previously activated information, which is irrelevant for the task at hand or has become irrelevant, after a goal shift can be cleared, while Restraint which occurs at the output level of processing is the prevention of automatic, momentarily inappropriate responses, from gaining control so that less probable, but appropriate responses may gain access to the processing system.

Support for the role of inhibitory processors as causal factors in reduction of working memory capacities is available from studies where young adults, who exhibited poor comprehension, were shown to have deficit suppression mechanism (Gernsbacher, Varner, & Faust, 1990) and adults with learning disability were found to make more intrusions errors than non disabled controls (Wilhardt & Sandman, 1998). Since reduction in inhibitory processors appears to lead to decrease in working memory capacities, it is possible that choking observed in tasks which rely heavily on working memory capacities might be due to a transient decrease in efficacy of inhibitory processes due to situational factors.

Mathematical performance is an area in which choking has been observed, especially among good performers. Research has documented that student performing well in mathematics exhibit higher working memory capacities (Beilock, 2007). According to Beilock and Carr (2005) it is probable that individuals with higher working memory might no longer be able to utilize this advantage when placed in a stress full situations (reflecting failure of inhibitory processors).

Asking volunteers how they solved the math problems, Beilock, Carr, MacMahon & Starkes (2002) discovered a reason behind the difference. In the low-pressure situation, the students with more working memory capacity were using their memory to solve many of the problems in their heads. The students with lower working memory capacity, on the other hand, used rules of thumb and educated
guesses to pick a multiple-choice answer, without actually going through the math involved. Those techniques were more effective than just picking answers at random, but not as reliable as doing the math. In high-pressure situations, however, the better students did not use their working memory as well, and they also switched to the rules of thumb. As a result, their scores dropped in high-pressure situations, while the average students' scores stayed the same. In fact, skill failure (and success) has been found to depend in part on how the performance environment influences attention and the extent to which skill execution depends on explicit attentional control. (DeCaro, Thomas, Albert, & Beilock, 2011).

Thus, it appears that high pressure situations experienced by students during examinations, specially the annual or competitive entrance examinations, would be detrimental to the performance of high performing students. The fact that many children face in arithmetic is evident from a report released, by the seventh Annual Survey of Education Report (ASER) of rural India (Jan 17, 2012) which showed decline in reading and mathematical ability of children in the age group between six and 14. The report was released by HRD minister. According to a Survey of National Council of Educational Research and Training (The Tribune, 22nd Sept. 08), more than 60 per cent of students in class 5th find it difficult to solve fraction, decimals and measurement questions. This survey found that 32 per cent of student scored less than 30 per cent in mathematics, while barely 11 percent achieved more than 80 per cent marks. A recent global survey (PISA) estimated that an Indian eighth grader is at the level of a South Korean third grader in math abilities (Chhapia, 2012). These results indicate that prevalence of mathematical difficulties is quite high in India.

In view of the above, it was felt that an investigate into the role of inhibitory capacities in choking in mathematical performance, especially among higher and low performing subjects could go a long way, in providing insight into the mediating role of inhibitory processes in central executive functioning. Thus, the following problem was delineated for the present study.

**Problem:** Role of Inhibitory Capacities in Chocking on Mathematical Performance.

**Objective:** The following objectives were delineated for the present study:
I. To study mathematical ability in secondary school students.

II. To study choking in mathematical performance in secondary school students

III. To study gender differences in mathematical ability and Mathematical Performance.

IV. To study the role of Inhibitory capacities on mathematical performance.

V. To study the effect of inhibitory capacities in choking on mathematical performance.

**Hypotheses:** On the basis of earlier researches, it was hypothesized that:

I. Mathematical Ability would be normally distributed among senior secondary students

II. Mathematical achievement would be significantly higher in the high mathematical ability group in comparison to the lower mathematical ability group.

III. Time pressure would lead to a significantly greater decrement in mathematical performance in the high mathematical ability group in comparison to the lower mathematical ability groups.

IV. Mathematical ability and performance would be significantly higher in boys as compared to girls.

V. Inhibitory capacities would be significant higher in the high mathematical ability group in comparison to the low mathematical ability group.

VI. Inhibitory capacities would discriminate between high and low mathematical ability groups.

VII. Inhibitory capacities would be significantly lower in high mathematical ability respondents who exhibit choking in comparison to the high mathematical ability respondents who do not exhibit choking.

VIII. Inhibitory capacities would discriminate between high mathematical ability-choking, high mathematical ability-no choking and low mathematical ability subjects.
The design and methodology used for achieving the above objectives have been discussed in Chapter IV.