UNIVERSITY OF CAPE COAST

EFFECTS OF REFLECTIVE TEACHING STRATEGIES ON PROBLEM SOLVING ABILITIES OF IMPULSIVE CHILDREN

EUNICE TORTO-SEIDU

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BY

EUNICE TORTO-SEIDU

Thesis submitted to the Department of Education and Psychology of the Faculty of Educational Foundations of the College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy Degree in Educational Psychology

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature .... Date ....

Name: ....

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature .... Date ....

Name: Prof. Elizabeth Foluke Adeniyi

Co-supervisor's Signature .... Date ....

Name: ....

ABSTRACT

Impulsive behaviour is a pervasive characteristic of Attention Deficit Hyperactive Disorder (ADHD), which is known to interfere with successful learning. The present study assessed three cognitive behavioural strategies for modifying impulsivity among children using the quasi-experimental approach. Two hundred and seventy-five primary four pupils from the Tamale Metropolis were used as subjects for the study. They were aged between eight and eleven years. Nine hypotheses were tested using the Solomon Four Group analytical procedure. The subjects were assigned to treatment and control groups. The treatment groups received training in cognitive modelling, self-talk or a combination of the two. The control groups received a placebo in drawing and creative arts exercises. Results revealed superiority in response-time and accuracy (to the Matching Familiar Figures Test-20) of the treatment groups over the control groups. These results subsisted at one-month follow-up measures. It is suggested that the school in collaboration with educational psychologists should establish remedial programmes in which reflective procedures could be employed to nurture impulsive children to employ the reflective approach in solving problems.

KEYWORDS

Cognitive style

Reflexivity

Impulsivity

Self-talk training

Cognitive model training

Matching Familiar Figures Test

Accuracy rate

Response time

Problem solving

Behaviour modification

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God richly bless everyone.

DEDICATION

To my husband Andrew, children, Adija, Annisah and Sala

and all members of La Familia and Torto Announcements

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CHAPTER ONE

INTRODUCTION

Background to the Study

Cognitive style is the manner in which individuals process information, take decisions and respond in problem solving situations. Cognitive style focuses on the mental processes that go into the making of decisions, but not on the specific decisions that a person makes. Different forms of cognitive styles have been described in literature such as the "field dependent-field independent" approach (Witkin, Oltman, Raskin & Karp, 1995), holistic analytic and verbal imagery (Riding & Cheeman, 1991) and reasoning intuitive and active contemplative (Hayes & Alison, 1996). Of interest to this study is the reflective-impulsive cognitive style identified by Kagan (1965) as the tendency for quick, not deliberate response. Put another way, reflectivity-impulsivity is the extent to which a person reflects upon the differential validity of alternative solutions in problem solving situations where many other possible responses exist (Kagan, Rosman, Day & Phillips, 1964). Reflective individuals are fastidious and deliberate, while impulsive individuals respond faster usually without accuracy (Yu, 1997).

The cognitive style dimension of reflectivity/ impulsivity has to do with the tempo of information processing in problem solving and describes the tendency to consider alternative-solution possibilities, in contrast with the tendency to make a spontaneous selection of a solution to problems with high response uncertainty (Kagan, Rosman, Day & Phillips, 1964; Child, 1995; Yu, 1997). The relatively stable disposition of not thinking before responding is referred to as impulsivity (Neitfeld & Bosma, 2003). Impulsive individuals have a fast-conceptual tempo, they tend to come forth with the first answer they can think of and offer quick responses. The opposite of impulsivity is reflectivity. The reflective child is less likely than the impulsive child to make a hasty, incorrect attempt to solve a problem and is more likely to consider or reflect on alternatives before committing himself or herself. The reflective approach may lead to problems in some school tasks (for example when students delay unnecessarily in cases where immediate answers are required), but the impulsive style has a greater potential of impairing academic performance (Isakson & Isakson, 1978). Research (Olasehinde, 1992; Gargallo, 1993; Nwamuo, 2010) has shown that the reflective approach to problem solving definitely has more merits over the impulsive style.

Olson, Bates and Bayles (1990) argued that 'self-regulation' does not develop until the third or fourth grade in school, corresponding to about age eight onwards. Kaufmann (2005) has also reiterated that impulsivity is normal in young children, but a greater number of them learn alternative responses as they grow older. Most children below age six are naturally active, have short attention span and are somewhat impulsive, often acting without giving much thought to consequences. However, from age six onwards children are expected to start controlling their impulse and the disposition should be stable by age eight.

Children who manifest impulsive behaviours often get into trouble in social situations, such as games and play activities. They demonstrate poor impulse control and are apt to take their turn before their time, or to respond incorrectly to game stimuli. Their poor impulse control also leads them to respond to teasing for, example, by hitting the person who teases them. They are often sorry for their actions and can sometimes discuss what they should have done had they taken their time to think about their actions (Melloy, as cited in Ziporli, 2008).

Teachers who refer to a student as impulsive usually conjure up images of children who rarely stop to think before they fully understand the directions, who are often remorseful when their actions have led to errors or mishaps, who call out frequently in class (usually with wrong answers) and have difficulty organizing their materials (Ziporli, 2008). An impulsive child may, for instance, disrupt a class discussion by blurting out the first answer that pops in his or her head, thereby upstaging the reflective types who may still be in the process of formulating more searching answers. It is even not rare to spot students who after signalling intention to respond, stand up and look blankly at the teacher without giving any response at all- obviously haven forgotten the purpose for their standing up in the first place. Not only do teachers easily get irritated at impulsive responses, such children also tend to be mocked by their colleagues. Impulsive responses are usually seen in the way children respond to multiple choice assessment tests.

In Ghana, assessment tests for schools at all levels (from the basic schools through the senior high and tertiary levels), make extensive use of multiple choice tests. The increasing enrolment in schools as a result of government initiatives such as the Free Compulsory Universal Basic Education (fCUBE), the School Feeding Programme and free Senior High School have reinforced the use of multiple-choice tests. Put another way, the increase in enrolment has compelled educators to structure their assessment of students such that it is easier to mark tasks given to them and to give quick feedback. Standardized examinations such as the Basic Education Certificate Examination (BECE) and the West Africa Senior School Certificate Examinations (WASSCE) also make use of multiple-choice questions. Impulsive children by their nature stand a greater risk of failing such tests which involve selection of the correct response among alternatives, because they have a fast conceptual tempo. This makes them not consider all the possible elements when solving problems, thereby missing out important cues that would lead to successful resolution of the task.

According to Egeland (1974), attempts to modify impulsive tempo have fallen into three categories. One way is to teach the child how to delay responding, another way is modelling reflective techniques for the child; and finally teaching the child more effective analytic strategies. Egeland (1974) in a study on training impulsive children to use more efficient scanning techniques and in simple response delay, found that it led them to produce longer latencies and fewer errors immediately after training. Kagan, Pearson, and Welch (1966) also trained children to delay responses, but without teaching them any improved problem-solving strategies. The children's response latencies lengthened, but their error scores did not improve. In other similar studies (e.g. Olasehinde, 1992; Nkrumah, 2013), the results of children who were made to observe reflective models, showed longer response latencies and improved accuracy scores. These findings suggest that impulsivity can be modified.

A series of research experimentally examined the effects of training students to learn by employing a strategy or set of strategies. These strategies that students use when confronted with problems influence how they perform in school, as well as how they accomplish various activities outside of school. Many studies have tried various reflective training strategies to modify impulsivity in children and have reported varying degrees of success. Some of these strategies include programmed instruction, biofeedback, cueing and self-talk/self-instruction. For instance, Graham, MacArthur, and Schwartz (1995) used Self-Regulated Strategy Development instruction; Meichenbaum and Goodman (1971), Cameron and Robinson (1980) and Villar (2007) used cognitive self-instructional training or self-talk; Tinius and Tinius (2000) used biofeedback and cognitive retraining; and Olasehinde (1992) used programmed instruction. These problem-solving strategies involved the use of mental processes or procedures for accomplishing a cognitive goal. For example, if students' goals are to write good essays, their strategies might include brainstorming and completing an outline. The studies reported that students who learn to make effective use of reflective strategies generally outperform those who have not learned such reflective strategies.

Among the strategies outlined, modelling and self-talk appear to be the most widely used strategies in impulsive behaviour modification. Children learn a great deal by imitation. They observe the people around them behave in various ways and behave as such. Bandura (1963), the leading proponent of observational learning, demonstrated how individuals pick cues from other people’s behaviours to modify their own in social situations. This he illustrated using the famous Bobo doll experiment (Bandura, cited in McLeod, 2011).

In the society, children are surrounded by many influential models such as parents within the family, characters on the television, friends within their peer groups and teachers at school. Models provide examples of behaviour to observe and imitate, hence the use of modelling is recommended in the training of a desirable behaviour. Bandura and Walters (1963) and Gorrel (1993), for example, suggested that an impulsive child's viewing of a reflective model will result in behavioural change. Other studies (Odoemelam, 1994; Nwamuo, 2010, Nkrumah, 2013) have also used modelling in impulsive behaviour modification, which they called cognitive modelling and all these studies produced favourable results.

Self-talk, self-instruction, private speech, or speaking aloud to oneself, is a phenomenon of child development that Vygotsky (1934/1962; 1930-1935/1978; 1934/1987) interpreted as the critical transitional process between speaking with others and thinking for oneself. He described the crucial role of private speech in his theory of the development of higher psychological processes. The phenomenon is usually observed in children as they play and perform all sorts of tasks. Researchers (Peters & Davies, 1981; Diaz & Berk, 2014; Harris, Reid, & Graham, 2004; Rivera-Flores, 2015) have taken a closer look at children's use of self-talk as a means of guiding behaviour. Self-talk is usually directed at oneself rather than to a listener and is demonstrated by the overt verbal behaviour that usually accompanies the ongoing activity. It has been observed that self-talk plays a regulatory role on behaviour. Vygotsky (1962) suggested that internalization of verbal commands is a critical step in a child's development of voluntary control of his behaviour. Other studies (Bem, 1967; Lovaas, 1964; Luria, 1959, 1961; Meichenbaum & Goodman, 1971) have provided support for increased use of cognitive self-instruction in impulsive behaviour modification.

Early in development, adult speech controls and directs a child's behaviour, but later, the child's own overt speech becomes an effective regulator of his or her behaviour. Results from the study of Meichenbaum and Goodman (1971) showed that children could be trained to use their natural tendency of private speech to regulate their impulsive behaviours. The training followed a developmental sequence in which an adult overtly verbalized the procedure for performing a task as the children observed. The children then followed with their own overt verbalization in the task performance, then later reverted to covert self-verbalization. This fading technique, overt then eventually to covert, led the impulsive children to provide themselves with internally generated verbal commands or inner speech which brought their behaviour under control and in effect responded appropriately to the task.

Cognitive modelling and self-talk are the two behaviour modification techniques usually employed with children. Many researchers have used either one of the two in modifying impulsivity. In some cases, however, researchers (Meichenbaum & Goodman, 1971) have chosen to put these two strategies together and have shown positive results. In the present study, cognitive modelling and self-talk were initially employed as independent behaviour modification strategies, after which the two were put together to examine their combined effects on children's impulsivity. In addition to these, the study investigated the effects of the behaviour modification techniques on pupils' approach to problem solving in Mathematics and English.

English, Mathematics and Science popularly described as EMS are the subjects that all students in Ghana study throughout their academic lives particularly at the basic and high school levels. However, English and

Mathematics are those that are speculated to require a lot of control in conceptual tempo, especially in multiple-choice examinations. In view of this, the present study assessed pupils' approach to problem solving in Mathematics and English after intervention.

Statement of the Problem

There are numerous factors that affect educational achievement, such as infrastructure, school quality, ability of students, availability of resources, Some studies (Opare & Dramanu, 2002; Etsey, 2005; Raychaudhuri, et al, 2010; Nyarkoh, 2010; Chowa, Masa, & Tucker, 2013; Helal, Li, Liu, et al., 2019;) which have investigated the causes of students' failure in the primary, junior and senior high schools, and colleges, have often focussed on such variables as school infrastructure and facilities, motivation, reinforcement, indiscipline and stress, socio-economic status of parents and parental involvement in students' education. But there are other factors which are not so physical, or obvious, including learning disabilities and impulsivity.

Impulsive behaviour is a pervasive characteristic of Attention Deficit Hyperactivity Disorder (ADHD) which has been noted to interfere with successful learning. Even though impulsivity is one of the symptoms of ADHD (which involves a combination of at least six other symptoms), not all impulsive children have ADHD. Children with ADHD are at risk of lower academic performance compared to their peers who do not have it. The symptoms can have a negative impact on learning behaviours and important aspects of the learning process, including attitude, persistence and motivation. There exist numerous studies (Loe & Feldman, 2007; Fried et al., 2017) that have shown the effect of high school failure of children with ADHD, even after controlling for variables such as learning disabilities, IQ and social status. What educators can do is to focus more on the symptoms such as impulsivity, that are modifiable and may lead to academic success. Children who display mainly impulsive characteristics look no different from all other regular children, and without acceptable diagnosis and intervention, they will grow into adulthood with the condition. Inattentive people may give effortless, automatic attention to activities and things they enjoy, but find it difficult to organize and complete a task (Neuwirth, 1994). Attention to the task at hand and careful consideration of the concepts to be acquired are essential for successful learning. This important fact has not always been taken into consideration in teaching and testing. Test responses are often the main basis for evaluation of educational success, yet educationists and evaluators often fail to give much consideration to the length of time the child takes to reflect on available alternative solutions. In most cases, impulsive children may score low marks (especially on multiple-choice questions) because they have a fast conceptual tempo. In other words, such children do not take the time to wait and assess all the alternative responses before arriving at the correct answer. Thus, impulsive children are not necessarily less intelligent than reflective children but among other reasons their impulsivity causes them to guess and quickly select, rather than think through possible solutions. The high failure rate recorded among school children for most of the Basic Education Certificate Examination (BECE) as well as in the West African Secondary School Certificate Examination (WASSCE) (Adane, 2013; Amuzu; G.N.A., 2020; Ankalibazuk & Abdulai, 2017) in Ghana could be an index of impulsivity. The reason being that, in all these standardized examinations (and in all the subject areas), the questions are grouped into two

(2) sections A and B, where the A consists of only multiple-choice questions. Besides these standardized examinations, most of the classroom evaluation measures (teacher-made tests) employ multiple-choice items. In such cases, impulsive children are unlikely to pass.

The Special Attention Project (2011) conducted in Ghana showed that impulsivity (as rated by participants; teachers, head teachers and parents) was the main cause of learning difficulties among children. Inattentiveness and lack of self-organisation stand out, while inappropriate social behaviour was also seen as common characteristics. In spite of these documented findings, educational researchers in Ghana tend to focus their research on areas other than impulsivity. Available studies on impulsivity were conducted in the Asian, Oceania and the Western countries. In recent times however, there has been increased interest in studies on cognitive style modification in educational psychology because those studies have demonstrated a strong link between students' thought processes and school achievement (Brannigan, Ash & Margolis, 1980; Wittrock, 1986). Although impulsivity was identified as one of the main causes of academic failure among students, not much has been done in Ghana to identify impulsive children in the regular classroom, and further, modify their behaviour or correct their impulsive tendencies. To the best of my knowledge, Nkrumah (2013) is the only study in impulsive behaviour modification that has been conducted in Ghana. Worthy of note is the observation that most of the studies on impulsive behaviour modification either used cognitive modelling or self-talk. However, since both have different procedures, it is possible that a combination of the two strategies may lead to enhanced modification in children's impulsiveness. In view of this, the present study assessed the effects of cognitive modelling, self-talk and a combination of the two strategies in modifying impulsivity among children. It also appears that most of the studies in behaviour modification ended after the individual has shown improvement in the targeted behaviours. This study however extended over previous studies to assess the impact of the research subjects' problem solving abilities in specific subject areas (Mathematics and English) after intervention.

Purpose of the Study

The overarching purpose of the study was to assess the effects of using reflective teaching strategies in modifying problem-solving abilities of impulsive children. Specifically, the study investigated:

1. the effects of cognitive modelling on problem-solving abilities of impulsive children.
2. the effects of self-talk training on problem-solving abilities of impulsive children.
3. whether a combination of training in self-talk and modelling was more effective in modifying problem-solving abilities of impulsive children than using a single strategy.
4. whether the reflective strategies used in modifying problem-solving abilities of impulsive children had effects on their approach to problem solving in English Language and Mathematics.
5. the relationship between impulsive behaviour and pupils' performance in the English Language and Mathematics.

Hypotheses

The study tested nine hypotheses.

$H_{01.}$ There is no significant effect of training in cognitive modelling on the problem solving abilities of impulsive children.

$H_{1.}$ Impulsive children who receive training in cognitive modelling will perform better on problem solving tasks than those who receive no training.

$H_{02.}$ There is no significant effect of training in self-talk on the problem-solving abilities of impulsive children.

$H_{2.}$ Impulsive children who receive training in self talk will perform better on problem solving tasks than those who receive no training.

$H_{03.}$ There is no significant effect of training in a combination of cognitive modelling and self-talk on the problem-solving abilities of impulsive children.

$H_{3.}$ Impulsive children who receive training in a combination of cognitive modelling and self-talk will perform better on problem solving tasks than those who receive no training.

$H_{04.}$ There is no significant difference between the effectiveness of cognitive modelling and self-talk training in modifying the problem-solving abilities of impulsive children.

$H_{4.}$ There is a significant difference between the effectiveness of cognitive modelling and self-talk training in modifying the problem-solving abilities of impulsive children.

H_{05}. There is a significant difference between the effects of a single reflective teaching strategy and a combined teaching strategy on the problem-solving abilities of impulsive children.

H_5. Impulsive children who receive training in a single reflective strategy will perform worse on problem solving tasks than children who receive training in a combined teaching strategy.

H_{06}. There is no significant effect of cognitive modelling on impulsive pupils' performance in Mathematics and English.

H_6. Impulsive children who receive training in cognitive modelling will perform better in Mathematics and English.

H_{07}. There is no significant effect of training in self-talk on impulsive pupils' performance in Mathematics and English.

H_7. Impulsive children who receive training in self talk will perform better in Mathematics and English.

H_{08}. There is no significant effect of the combined strategy of cognitive modelling and self-talk on impulsive pupils' performance in Mathematics and English.

H_8. Impulsive children who receive training in the combined strategy of cognitive modelling and self-talk will perform better in Mathematics and English.

H_{09}. There is no significant relationship between impulsive behaviour and pupils' performance in English Language and Mathematics.

H_9. There is a significant relationship between impulsive behaviour and pupils' performance in English Language and Mathematics.

Significance of the Study

Workshops from this study would expose teachers to some basic characteristics for identifying impulsive children in their classrooms. It would also equip school administrators with skills to modify the cognitive style of impulsivity among primary school pupils. Classroom teachers would also be informed on how to transform their teaching with the inclusion of these strategies in their repertoire of teaching methods for the benefit of all children.

The information presented here would, through Parent Teacher Association meetings, inform parents about the characteristics of impulsive children so that they can identify them on time and seek support for intervention before they graduate into unmanageable behaviours. Findings from this study, when presented at workshops, would also provide curriculum planners especially for teacher training institutions, with justification on the need to incorporate teaching methods that facilitate reflective thinking skills in teachers during training. It would also enable curriculum planners to include more reflective thinking activities in the teaching syllabuses for the various subjects of the school curriculum. Further, findings from this study would add to literature available on cognitive style modification for subsequent researchers especially in Africa, who are interested in this area of study.

Delimitations of the Study

This study investigated the effectiveness of three reflective teaching strategies on problem-solving abilities of impulsive children. These three reflecting teaching strategies were cognitive modelling alone, self-talk training alone, and a combination of cognitive modelling and self-talk. The study was delimited to only primary four school children in the Tamale metropolis.

The study was delimited to three clusters of schools conveniently chosen out of the seven clusters in Tamale, the Northern Region of Ghana. The three clusters that were chosen are Choggu, Tishegu and Bagabaga Clusters. From these three clusters, a total of 275 pupils in primary four from seven schools, were identified as impulsive inaccurates by the research instruments, and were used as subjects in the study.

Instruments for the study comprised the National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale-Teacher Informant (NICHQ-VAS-TI), Impulsive Related Questionnaire for Children (IRQC), Checklist on Impulsiveness for Parents (CIFP), a Training Evaluation Questionnaire (TPEQ) (adopted from Nkrumah, 2013), Academic Performance Tests (APT) in English Language and Mathematics constructed by the primary four teachers in the selected schools. A training program on self-talk and cognitive modelling with reflective thinking skills was developed with the teachers and used in the classrooms. There were sixty (60) questions adapted from Kagan's Matching Familiar Figures Test-20 (MFFT-20), for use as pre-test, post-test and delayed-post-test.

The study also used children only, specifically those between ages seven and eleven because that is the age range within which impulsivity is highly manifested. Finally, only teachers in the selected schools were used as models in the study.

Limitation of the Study

One limitation of the study is that subjects could not be randomised because of the nature of the cluster system in the Tamale Metropolis. Hence intact groups were used. In addition, I would have loved to use a larger sample size, but time resource could not permit that.

Operational Definition of Terms

The following terms were operationally defined as used in this study:

Impulsivity: A personality trait characterized by a child's inclination to act or initiate a behaviour without adequate forethought of the consequence of the action. This was measured in the study through questionnaires (the NICHQ-VAS-TI, IRQC and CIFP) behavioural rating scales.

Cognitive Modelling: It is a form of observational learning in which clients first observe and then imitate a model on how the model approaches cognitive tasks or solves cognitive problems.

Self-talk training: A situation in which students are taught how to talk themselves through a task or activity, as a way of regulating behaviour, by making them focus on that task to completion.

Problem solving tasks: This was measured in the study through the Matching Familiar Figures Test-20 (MFFT-20) adapted from Kagan (1968).

Performance test: These were teacher made tests in English and Mathematics conducted in the classroom to determine the level of children's academic performance.

Impulsive Behaviour Modification: This is a process of correcting impulsive tendencies in children to enable them think reflectively.

Response Time: The amount of time a child spends in solving the MFFT- 20 task (measured in minutes herein).

Accuracy/Error Rate: The number of incorrect or wrong answers or mistakes a pupil makes on the MFFT-20.

Impulsive inaccurates: Pupils who were fast in completing the MFFT but made more errors (with reference to their norm group).

Organisation of the Study

Subsequent chapters in this study are as follows:

Chapter 2 was a review of related literature, grouped under three subheadings of theoretical, conceptual and empirical review. The theoretical review covered four theories namely; the Theory of Modelling by Bandura (1968), the Socio-Cultural Theory by Vygotsky (1896 - 1934), the Cognitive Behavioural Therapy by Aaron Beck (1967), and the Problem-solving Theory by Krutetskii (1976) and others. The conceptual review comprised the following areas; Concept of Cognitive style; Reflectivity-Impulsivity Dimension of Cognitive style; Measurement of Reflectivity-Impulsivity Cognitive Style; Symptoms of Impulse disorder; Potential sources of impulsivity: biological or environmental? Empirical literature was reviewed in the following areas: Reflectivity-impulsivity and cognitive problem solving; Cognitive modelling training and impulsivity; Self-talk training and impulsivity; Training in combined methods and impulsivity; Impulsive behaviour modification and academic performance. Chapter 3 was a description of the research methodology employed in this study. It discussed the research design, the sample and sampling techniques, the methods used to collect data, as well as the methods used to analyse the data. Chapter 4 presented the results of the study and discussions on the findings. The final Chapter 5 presented conclusions and recommendations made, as well as suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

The study sought to investigate the effect of reflective teaching strategies on problem solving abilities of impulsive primary school children. This section presents the literature review which focuses on the concepts and theories, as well as empirical literature related to impulsivity and methods of modification. Specifically, literature was reviewed in the following areas:

Theoretical Framework

1. Theory of modelling (Bandura)
2. Socio-Cultural Theory (Vygotsky)
3. Cognitive Behavioural Therapy
4. Problem-solving Theory

Conceptual Review

5. Concept of Cognitive style
6. Reflectivity-Impulsivity Dimension of Cognitive style
7. Measurement of Reflectivity-Impulsivity Cognitive Style
8. Symptoms of Impulse disorder
9. Potential sources of impulsivity: biological or environmental?

Empirical Review

10. Reflectivity-impulsivity and cognitive problem solving
11. Cognitive modelling training and impulsivity
12. Self-talk training and impulsivity
13. Training in combined methods and impulsivity

14. Impulsive behaviour modification and academic performance

Theoretical Framework

Theory of Modelling (Bandura, 1968)

Most human behaviour is learned through observation and modelling of actions and events in the environment. Modelling is also called observational learning or imitation. It is a procedure that is based on observing a live or symbolic model perform a behaviour or attitude that one may want to acquire or change. Albert Bandura is the main proponent of this type of learning.

According to Bandura (1977),

> ‘learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behaviour is learned observationally through modelling: from observing others, one forms an idea of how new behaviours are performed, and on later occasions this coded information serves as a guide for action.’ (p22).

Bandura propounded the theory of modelling to counteract the trial and error regime of previous behaviourist learning theories of Thorndike and Skinner (Bandura, 1963, 2006). He did not think favourably on the use of laboratory studies to propound theories, as he felt the critical conditions present in natural situations could rarely be produced in laboratories. The natural environment could have some potentially dangerous irreversible consequences. Bandura therefore felt that relying on “differential reinforcement of trial-and - error performances” (Bandura, 2006, p. 3) or various teaching activities was not acceptable for developing competences.

> 'Had experimental situations been made more realistic so that animals toiling in Skinner boxes and various mazes were drowned, electrocuted, dismembered, or extensively bruised for errors that invariably occur during early phases of unguided learning, the limitations of instrumental conditioning would have been forcefully revealed.' (Rao, 2007, p. 224).

For Bandura, under such circumstances, modelling influences are more favourable in promoting everyday learning because there is stronger prevailing influence of examples in developing and regulating human behaviour.

Human behaviour is largely transmitted, deliberately or otherwise, through exposure to social models. Through observation of competent models demonstrating the required action, people can even be taught dangerous skilful performances without needless errors. Complex behaviours such as linguistic skills can also be taught mainly through the influence of models, behaviour which could otherwise not have been performed by just reinforcement. Per Bandura and McDonald (1963), and Luchins and Luchins (1966) assertions, for example, even where it is possible to establish new patterns of behaviour by other means, providing appropriate models can shorten considerably the acquisition period.

In Bandura's Theory of Social Learning (Bandura, 1977), modelling is key because its influences have broad psychological effects. This he confirmed in his study of preschool children (Ormrod & Rice, 2003) which involved placing a blow-up doll (Bobo doll) in a room with other toys and exposing three different groups of children to different behaviours. One group witnessed an adult being aggressive towards the doll, another group observed an adult display non-violent behaviour towards all toys in the room. A third group did not observe any model. When placed in the same room with all the toys, the children who witnessed the aggressive behaviour performed in like manner towards the Bobo doll, those who observed the non-violent behaviour and imitated the same behaviour. This for Bandura illustrated the importance of modelling in Social Learning Theory. Not only can modelling be used to teach aggressive behaviours, it can also be used to teach morality, judgement and to help develop cognitive abilities (Bandura, cited in Ananda, 2006).

From his research, modelling influences have three main effects on the learner/observer (Bandura, 2006). In the first place, observers are able to acquire new patterns of behaviour. This is seen when models demonstrate novel behaviours which observers have not yet learned to make, which they are later able to reproduce in very identical form. Secondly, modelling influences are able to strengthen or weaken responses based on the learner's observation of consequences that go with the responses; whether punishing or rewarding. Crooks (as cited in Bandura, 2006) noted that exploratory behaviour tends to decrease when the organism observes punishment being meted to another because of similar behaviour. Finally, the behaviour of others usually serves as cues to facilitate performance of similar responses. People usually applaud, run, or even join queues because they see others doing same, sometimes without even finding out why the people are taking those actions. In so many situations, behaviour is prompted and directed by the actions of others. Here, no new responses are shown, but the 'imitated' behaviour is socially sanctioned and therefore unrestrained.

The principles of the modelling theory demonstrate that modelling is used not only in the teaching of desirable and undesirable behaviours, but can also be used in teaching judgment, morality, and help develop cognitive abilities (Bandura, 1989). The development of cognitive abilities is of interest in this study because it shows that modelling can be seen in two fundamentally different-yet both relevant and applicable-ways. From one perspective, responses to modelling are somewhat concrete; individuals mimic directly the modelled behaviour very closely as in the case of aggressive behaviour (from the Bobo doll experiment). From an alternate perspective, responses to modelling are quite abstract; individuals can transpose information they have gained from one modelled scenario and apply it in different areas. These ideas are important because they mean that we do not necessarily have to get a direct experience of a situation to know how to behave or respond. Teachers can train children in reflective thinking in a specific subject area, but the children will be able to transpose and apply that learning experience in other subject areas, and even apply it in various situations away from the classroom setting. Another example, using linguistics, would be a child's ability to construct similar sentences about entirely different events or things based on an abstract idea of appropriate syntax. There is, however, a considerable amount of determinism that factors into the cognitive modelling theory. For example, not all parents (nor unfortunately, even teachers) can appropriately model advanced linguistic structures, so the development opportunities for their children may be more limited. Because social cognitive theory accepts a certain element of determinism in cognitive development, it is helpful to consider the position of the individual child amongst other determining factors (Pajares, 2002).

Social learning theory explains human behaviour in terms of continuous reciprocal interactions. Bandura proposes a form of this interaction that he terms reciprocal determinism. It is an interplay between the individual, behaviour, and the environment. What Bandura illustrates with this model is that humans do not simply react but can actively alter their environment and their behaviour (Bandura, 1998). In considering the active interplay between the individual and behaviour, behaviour depends on factors such as the individual's expectations or goals. Similarly, behaviour can be conditioned, thus controlling the individual. Personal achievement in the classroom setting can be impeded by environmental inputs such as ineffective teaching methods, outside distractions, inability to identify individual strengths and weaknesses, poor study habits and socioeconomic factors; these effectively limit the individual's access to certain developmental opportunities. However, individuals too can affect the environment; a cane-wielding teacher can, for example, alter the classroom environment just by their entry into the classroom, just as a child who has had a fight with the peers during break may not be emotionally ready to pay attention to the lesson in class, and may distract others in the class with fidgeting. A child who does not understand a lesson and cannot do exercises that follow could disturb the class and cause the teacher to reprimand him/her, leading to negative feelings for both the teacher and the subject. Our behaviour also determines our environment. A loud and carefree individual who jokes or pulls pranks to make people laugh may infuse the class with liveliness and fun. In our daily lives, our environment may be quite limited, consisting only of our school, work or home settings. Similarly, since our environment is not a static one, it can influence our behaviour; a change in environment from one school to another may change a child into becoming quieter and better-behaved, or stubborn and unyielding. A change from a lower to upper class could make the child more serious and reflective in his/her studies.

Bandura (1977) also proposed four conditions that are necessary for effective modelling to take place. They are attention, retention, production and motivation. Attention must be given to the behaviour being modelled for learning to take place. Whether attention to a model will be increased or reduced depends on some characteristics of the situation or event being observed, such as novelty, distinctiveness, and relevance. In addition, personal characteristics of the observer, such as their level of arousal, cognitive and perceptual abilities and past consequences affect attention. If the observed behaviour is to be reproduced, the observer must retain or remember the features of the behaviour observed. This includes how the information is encoded and organised. Retention is influenced by characteristics of the observer (including the ability to cognitively rehearse information) and of the event/situation (whether it is plain, simple or there are complexities). To reproduce, the observer organises responses according to what was observed. Observer characteristics here include the physical and cognitive capabilities. The final condition is motivation: this gives the observer a good reason to imitate the behaviour. Motivation depends on the expectations of the observer, and includes past and expected rewards, anticipated consequences of the behaviour.

Impulsive children by their nature do not pay attention and would not persist on a task till it is completed. They are often teased or punished in class because of their blurting out incorrect responses before being called. Training by modelling the appropriate behaviour by the teacher and peer models helps impulsive children learn the socially sanctioned behaviour. The processes involved in effective modelling, takes impulsive children through a step by step build up to the accepted behaviour. It also helps to slow them down in order to reflect over problems and produce acceptable solutions.

Meltzoff and Moore (1983) demonstrated that even babies not yet three days old seem inclined towards copying others. They conducted the study at a Swedish Hospital in Seattle, with 40 new-born infants, the youngest being only 42 minutes old. The babies watched an adult opening his mouth or poking out his tongue. The model performed one of these gestures repeatedly for four minutes before switching to the other gesture for another four-minute interval. An independent observer who could not see the model's actions rated 26 of the 40 babies as producing more mouth opening when the model was mouth opening and more tongue protruding when the model was doing that. In a similar study design, Field, Woodson, Greenberg and Cohen (1982) showed that observers could correctly guess which of three facial expressions - surprised, sad or happy - new-born infants were imitating 76%, 59% and 58% of the time, respectively. This they considered better than the 33% hit rate that one would expect if infants were completely hopeless at following along.

For a successful life, people must learn, through observing the behaviour and attitudes of other people, situations and events and outcomes that accompany them. Bandura's theory of modelling is relevant to this study because the various processes in modelling such as attention, are important for teaching the strategies that will improve problem solving abilities of impulsive children, as they learn to attentively observe teachers' demonstration of appropriate behaviour in the classroom. Further, research has shown that modelling is an effective instructional strategy in that it allows students to observe the teacher's thought processes (Salisu & Ransom, 2014). Larson (1968) showed that children imitated violent hero models they observed on television, irrespective of whether they were real humans acting, or cartoon characters, 56% of the time. Heyes (1994), on the contrary, claims that observation of a human model/actor is fundamentally important in learned behaviour. Bearing this in mind, in the school setting, teachers themselves or peers as live models, can engage students more in attending to behaviours that encourage learning. One advantage of modelling is that it can be used in any grade and ability level and across disciplines. This fact also increases the relevance of this theory to the study.

Socio-Cultural Theory (Vygotsky, 1896-1934)

Lev Vygotsky developed a sociocultural approach to cognitive development. His theories were developed around the same time as Jean Piaget was starting to develop his ideas (1920's and 30's). This endeavour was cut short when he died at the age of 38, and so his theories are incomplete - although some of his writings are still being translated from Russian.

Vygotsky's theory (1978), that has now come to be known as the Social Development Theory, and has become the basis of much research and theory in cognitive development. Vygotsky's theory is founded on constructivism, which sees learning not as an acquisition, but rather as an active process of constructing knowledge. Knowledge construction is based on personal experiences, environmental situations and events. Knowledge is interpreted against the backdrop of these experiences and social negotiation. Social development theory therefore states that cognitive development proceeds from social interaction (Vygotsky, 1978). Higher mental processes in the individual have their basis in the socio-cultural context because individuals interpret and make meaning out of life based on the social and cultural context within which they are raised. In addition to the theme of social interaction, Vygotsky also mentioned a more knowledgeable other and a zone of proximal development as important components of the cognitive theory.

Social interaction plays an essential role in the development of high cognitive abilities because for Vygotsky, the community is of central importance to how people make meaning of their experiences (Vygotsky, 1978). Social interaction places great emphasis on culture shaping cognitive development. Hence, cognitive development varies across cultures. Vygotsky places great emphasis on the role of language in cognitive development because that development comes about because of internalization of language. Vygotsky finds adults as important actors in the social interaction for cognitive development because, they transmit the tools of intellectual adaptation from their culture to the children to internalize. Adults act as skilful tutors or more knowledgeable others, who through social interaction with the children, model behaviour and provide verbal instructions for the child. These more knowledgeable others may be teachers, parents, peers who have a better understanding or a higher ability level than the learner, with respect to a task, process, or concept. Through social interaction, they help the child to make meaning of the actions and instructions of the tutor, then the child internalizes that meaning and uses it to regulate or guide their future performances. Shaffer (1996) uses the example of a young girl who performs poorly in attempting to solve her first puzzle alone. The father then sits with her and demonstrates some basic strategies, such as finding all the edge pieces and provides a couple of pieces for the child to put together herself and offers encouragement when she does so. As the child becomes more competent, the father allows the child to work more independently. According to Vygotsky, this type of social interaction involving cooperative or collaborative dialogue promotes cognitive development.

Vygotsky (1934, 1987) described private speech as: 'A revolution in development which is triggered when preverbal thought and pre-intellectual language come together to create fundamentally new forms of mental functioning'. (cited in Fernyhough & Fradley, 2005: p. 1). Diaz and Berk (2014) also defined private speech as being 'in contrast to social speech, as speech addressed to the self (not to others) for the purpose of self-regulation (rather than communication)' (p. 62). They show that private speech helps the individual to control or regulate herself or himself to be able to perform tasks that demand mental processes such as focussing attention, planning, monitoring, pacing of activities, self-motivating, among others. These mental processes have important implications for the study because they do not only ensure school success for impulsive children but are important for later successful decision making in adult life.

Language develops from social interactions, and for communication purposes, plays a critical role in cognitive development. It is the main means by which people transmit information to each other, as well as a very powerful tool of intellectual adaptation. Vygotsky (1987) distinguishes between three forms of language. The first is social speech which is external communication used to talk to others and is typical from age two years; private speech, which though overt, is directed to the self and serves an intellectual function, typically from three years. This latter private speech goes underground, diminishing in audibility as it takes on a self-regulating function and is transformed into the third form of silent inner speech (typical from seven years). Diaz and Berk's (1992) research has shown that children's private speech usually peaks between three to four years, by six to seven years it decreases, and by ten years, it fades out to be mostly internalized.

Vygotsky (1987) intimated that the use of private speech is a product of the social environment. As such, there is high positive correlation between private speech and social interaction. Children from linguistically and cognitively rich environments usually start using private speech earlier than those from impoverished environments. Enriched environments would imply a higher socioeconomic status. Children from impoverished environments with lower socio-economic status, and less social and verbal interactions become victims of delay in private speech development. They are therefore more likely to be at a cognitive disadvantage in their performance in school. By implication if children begin internalization of private speech from age seven but are unable to perform the essential cognitive processes required to complete cognitive tasks due to inability to regulate their impulses, then there is a missing link. It must be possible to mitigate the situation by a return to the use of private speech, this time being actively learned, and from where children could rebuild the needed mental operations to achieve success in problem solving.

Private speech or self-talk as it is referred to in this research has become a widely discussed psycholinguistic topic in empirical literature on cognitive development. Berk (1986) provided empirical support for the notion that self-talk operates similarly in all children regardless of cultural background. In Vygotsky's view, self-talk uses language to regulate self and behaviour. It helps children's development when it becomes a tool to plan activities and strategies. Language use accelerates thinking and understanding. Vygotsky (1987) noted that children who self-talk very often are more socially competent than those who do not. It helps them think, enhance their imagination and overcome task obstacles. This makes Vygotsky's theory relevant in the study. Impulsive children have cognitive challenges that they need to overcome for school success and that is why self-talk is one of the strategies used to modify behaviour here. Winsler, Abar, Feder, Schunn, and Rubio (2007) noted that private speech (self-talk) is useful for children especially when they are engaged in tasks they find difficult, where they attempt to regulate themselves by verbally planning and organising their thoughts. Tasks in which self-talk become particularly useful include problem-solving, Mathematics (Behrend, Rosengren & Perlmutter, 1992; Ostad & Sorensen, 2007) and language (Berk & Landau, 1993).

Furthermore, Berk (1986) provided empirical support for the notion that private speech develops similarly in all children regardless of cultural background. In view of these benefits of private speech, I find the self-talk strategy postulated by Vygotsky to be a useful tool for helping children to be more reflective when performing cognitive tasks, a tool that could improve their problem solving abilities and lead to successful outcomes on such tasks.

Cognitive Behavioural Therapy (Beck, 1967)

Educators seek to prepare students to live productive lives by helping them to acquire necessary skills to function independently. These skills include the ability to make wise choices by learning from interactions with their environment - school, home, community. Students with behavioural problems, however, face some challenges in acquiring these skills. They need to be specifically instructed on how to acquire and use these skills in varying situations. They need to be taught, not what to think, but how to think logically (Daunic, Smith, Brank & Penfield, 2006).

Teachers who have to work with students with behavioural problems have an uphill task. Such students often show deviant behaviours such as conduct problems, impulsivity, inability to stay on task, aggression and disrespect to authority. They are also often unable to respond appropriately in classroom situations and interactions. They need to be taught skills that will help them choose and implement acceptable behaviours. An approach to help mitigate these situations is the use of Cognitive Behavioural Therapy, (Cobb, Sample, Alwell, & Johns, 2006). Impulsivity is one of the behavioural challenges that teachers and classmates are confronted with, and which Cognitive Behavioural Therapy (CBT) has solutions to. That makes this therapy relevant to this study.

Cognitive Behaviour Therapy (CBT) was pioneered by Aaron Beck (1967). During psychoanalytic sessions with patients, he observed that they seemed to be having a kind of dialogue going on in their minds even though what they actually said was minimal. He felt there was an important link between thought and feelings, and that identifying their thoughts would make people understand and confront their difficulties. As the emphasis then was on thoughts, Beck called the interventions cognitive therapy (Martin, 2016). Even though cognitive activities are not overt, researchers in cognitive assessment often use behavioural data as a source of validation to document reliability of cognitive strategies (Dunkley, Blanstein & Segal, 2010). Therefore, over time, the name has changed to Cognitive Behavioural Therapy.

Galeazzi and Meazzini (2004) defined Cognitive Behavioural Therapy (CBT) as characterized by a form of psychotherapy aimed at modifying not only overt behaviours, but also beliefs, attitudes, cognitive styles and expectations of the client. Dobson (1988) used the term to refer to changing behavioural problems by the modification of cognitive structures and processes, using a numerous range of therapies, including problem-solving therapies, cognitive restructuring methods and coping skills therapies. These strategies are used to change negative or unhelpful behavioural patterns.

In defining Cognitive-Behavioural Therapy (CBT), Dobson and Dozois (2010) mentioned three core propositions of CBT. According to them, cognitive activities do influence behaviour; cognitive activities may be monitored and altered; and finally, that cognitive change may lead to a desired behaviour change. According to Mahoney (1974), thinking played a mediational role in behavioural and emotional reactions to the environment. This mediational concept which yielded to several empirical evidences (Hollon & Beck, 1994; Dobson, Backs-Dermott & Dozois, 2000; Dozois and Beck, 2008), formed the foundations for cognitive-behaviour therapy. The first proposition that cognitive activities influenced behaviour merely restates the mediational model. Cognitive appraisal of events does affect an individual's response to those events. Cognitivists use schema to refer to a person's mental framework view of reality based on their previous knowledge and experiences (Piaget & Cook, 1952). People's actions and reactions are mediated by their schema interpretation of those events, and since it is difficult to directly access their thinking, Glass and Arnkoff (1982, 1997) proposed some strategies for assessing people's thoughts; these included assessing recordings of client's actual self-talk, and aiding clients to record their thoughts as they go through actual or simulated experiences in their environments. Such thoughts may be recorded immediately upon cueing through questionnaire completion or personal written narratives.

In relation to the second proposition that cognitive activities may be monitored and modified, researchers like Segal and Shaw (1988) believed cognitive activities can be assessed from behavioural data, even though there may be biases in the reporting which may require further validation. Strategies used to monitor cognition have often focused on content reports, and not the processes. Dunkley, Blankstein and Segal (2010), therefore were of the view that simply monitoring cognitive activities may not necessarily lead to an alteration in cognitive processes and it may not be possible to measure the level of alteration.

The last proposition that cognitive change may lead to behaviour change has been acceptable to cognitive-behaviour therapists, who feel cognitive change, in addition to overt reinforcement, provides another alternative method for desired behaviour change. The acceptance led researchers in the area to embark on the difficult journey of documenting the effects of cognitive mediation.

Bandura (1977, 1997) demonstrated that a person's expectancy of a situation could strongly predict that person's behaviour towards that situation. One could infer that if an impulsive child is taught some cognitive strategies such as cognitive modelling for use in the classroom, it could lead to a higher expectancy of performing that activity better and subsequently predict a better behaviour towards that activity. The inference has still proved difficult to document because researchers have not succeeded in finding a way to measure the change that cognitive processes undergo to change behaviour (Dobson & Dozois, 2010).

Kanfer and Saslow (cited in Kaplan and Saccuzzo, 2009, p. 407) devised a basic cognitive behavioural assessment model with four steps:

1. Identify the critical behaviour
2. Determine whether the critical behaviour is in excess or deficit
3. Evaluate the behaviour to identify a baseline in terms of duration, frequency or intensity
4. Attempt to decrease the behaviour if it is excessive or to increase it if it is in deficit.

CBT involves using various cognitive strategies such as problem solving, learning skills and coping therapies to modify cognitive structures to change behavioural problems. CBT is a structured therapy oriented towards practical solutions to current problems. It focuses on the factors that maintain the problem behaviour and not on their origins. It does not need a long duration for its effectiveness to be obvious (6 -24 hours of sessions depending on the severity of the distorted thoughts). The modification focusses on changing unhelpful patterns in beliefs, thoughts and attitudes. It has often been described as a talk therapy (Bowers, n.d.) because it involves the use of positive talk to influence a person's view of themselves, a healthy coping mechanism to make one feel better about themselves. It helps to draw individuals' attention to their negative interpretations and patterns of their behaviour that reinforce their distorted thinking, guiding them to alternative ways of thinking which will ease their anxiety and lead them into making positive interpretations of events that will influence their actions and behaviours.

Because of the way it works, I see CBT as an important solution to help impulsive children achieve better performance on cognitive tasks in the classroom, hence its inclusion in the theoretical framework for this study. It presents cognitive behavioural techniques as educational skills that are acquired through repetitive practice in both class and home assignments (Kendall, 2000). These are essential training aspects for the impulsive child which enable several instances to practice behaviour contrary to the identified negative behaviour, which in this instance is impulsivity. It therefore aims at helping beneficiaries to develop independent self-help skills not only for the immediate problem, but also for specific useful life long skills as part of the behaviour modification. Unlike other psychotherapy strategies which randomly involves the client being allowed to just talk on, CBT has a structure which involves the therapist meeting the client to discuss the problem and then working towards set goals. They then plan how the sessions will go and provide ways of assessing progress during and after the session, including the use of homework assignments for the client. Some of the techniques used for cognitive-behavioural therapy include guiding and positive self-statements, self-talk, recognising faulty patterns of thinking and modelling. These help to train the impulsive child to delay responses, reflect, self motivate in order to complete the required task.

Cognitive behavioural therapy may have some flaws, such as its dependence on willingness of the child to actively and willingly learn and use the skills taught. The task of players involved in the behaviour change (such as teachers and family) to constantly encourage and reinforce the child to make use of the skills learned, could also play a significant role in lasting outcome of the therapy. Nonetheless, CBT has played a significantly positive role in the treatment of a variety of disorders such as obsessive-compulsive disorder (OCD), eating disorders, personality disorders and conduct disorders such as impulse control problems (Dobson, 1986).

Problem-solving Theory

Solving problems are an essential part of everyday life. All people have to solve problems that they face as the days unfold. The ability to solve one problem helps one to adapt to the environment and leads to build-up of higher and higher cognitive processes. Theoretically, a problem is understood as a difficulty of theoretical or practical nature that causes an inquiring attitude of a subject and leads him/her to the enrichment of his/her knowledge (Kupisiewicz, cited in Dostál, 2014). This term in the field of education is similarly understood by Polish scientist, Okoń (cited in Dostál, 2014) who defines a didactic problem as a practical or theoretical difficulty that a pupil has to solve independently by his own active research.

Different theorists have explained problem solving differently based on their theoretical perspectives. Behaviourist researchers argued that problem solving was a reproductive process. Thus, an organism, when faced with a problem applied behaviour that had been successful on a previous occasion. Successful behaviour was itself believed to have been arrived at through a process of trial-and-error, propounded by Thorndike (1911), when he developed his law of effect after observing cats discover how to escape from the cage into which he had placed them. This greatly influenced the behaviourist view of problem solving.

From the Gestalt psychologists' perspective, problem solving was a productive process. In particular, in the process of thinking about a problem, individuals sometimes "restructured" their representation of the problem, leading to a flash of insight that enabled them to reach a solution. Köhler (1925) described a series of studies with apes in which the animals appeared to demonstrate insight in problem solving situations.

The cognitivists such as Newell and Simon (1972) in a publication outlined their problem space theory of problem solving. In this theory, people solve problems by searching in a problem space which consists of the initial (current) state, the goal state, and all possible states in between. However, problem spaces can be large, so the key issue is how people navigate their way through the possibilities, given their limited working memory capacities. For many problems, we may possess domain knowledge that helps us decide what to do, but for novel problems Newell and Simon proposed that selection by the problem solver is guided by cognitive short-cuts, known as heuristics. The simplest heuristic is repeat-state avoidance or backup avoidance, whereby individuals prefer not to take an action that would take them back to a previous problem state. This is not really helpful, especially when a person has taken an inappropriate action and actually needs to go back a step or more.

Kaur (1997) mentioned the different categories that literature has used to refer to problem solvers; they have distinguished among "good" and "poor", "expert" and "novice", "successful" and "unsuccessful" problem solvers among many other categories. Comparing the behaviours between successful and unsuccessful problem solvers, Dodson (1972) found that good problem solvers were superior with respect to verbal and general reasoning ability, spatial ability, positive attitudes, resistance to distraction and divergent thinking.

Krutetskii (1976) found that a major difference between good and poor problem solvers lies in their perception of the important elements of the problems they were attempting to solve. Good problem solvers typically have certain abilities that poorer problem solvers lacked, such as the ability to distinguish relevant from irrelevant information, the ability to see quickly and accurately the mathematical structure of a problem, and the ability to generalise across a wide range of similar problems. Schoenfeld (cited in Kaur, 1997) suggested that good problem solvers can be distinguished from poor problem solvers in at least five important ways:

1. The knowledge of good problem solvers is well connected and composed of rich schemata while that of poor problem solvers is not.

2. Good problem solvers tend to focus their attention on structural feature of problems while poor problem solvers focus more on surface features.

3. Good problem solvers are more aware than poor problem solvers of their strengths and weaknesses as problem solvers.

4. Good problem solvers are better than poor problem solvers at monitoring and regulating their problem-solving efforts.

5. Good problem solvers tend to be more concerned than poor problem solvers about obtaining "elegant" solutions to problems.

The various writers outlined here seem to converge on the ability to maintain concentration and regulating impulse as a significant trait of good problem solvers. Tsai et al. (2012), for example, analysed visual attention for solving multiple choice science problems. His study showed that successful problem solvers focused more on relevant factors while unsuccessful problem solvers experienced difficulties in decoding the problem, in recognizing the relevant factors and in self-regulating (Heller & Hungate, 1985). Reflective problem solvers have good impulse control and are able to focus attention on an activity over a period before responding. Hence, it is expected that after the impulsive subjects in this study have undergone the intervention in the strategies employed herein, they should be able to solve problems using the reflective approach. In effect, the impulsive subjects in this study are expected to become good problem solvers after intervention.

Conceptual Review

Concept of Cognitive Style

Many descriptions of cognitive style abound in literature. The term has been used by different scholars to refer to different ways of processing information, in other words, the processes people use in thinking to arrive at solutions to problems. The concept was first formally introduced over eight decades ago by Allport, which he defined as an individual's typical or habitual mode of problem solving, thinking, perceiving, and remembering (Allport, 1937).

Goldstein and Blackman (1978) defined cognitive style as "a hypothetical construct that has been developed to explain the process of mediation between stimuli and responses. It refers to characteristic ways in which individuals conceptually organize the environment" (p. 4). Riding and Rayner (2013) defined the concept as including fixed characteristics relating to methods of information processing and organization. Messick (1982), defined cognitive styles as "information processing regularities that develop in congenial ways around underlying personality trends. In this view, cognitive styles are intimately interwoven with affective, temperamental, and motivational structures as part of the total personality" (p.5).

Brodzinsky (1980), for instance, described cognitive style as a relatively stable self-consistent mode of adaptation that mediates the way in which the individual processes information. Price (2004), indicated that cognitive style reflects the ways in which individuals process information and make sense of their world. Kirton (2003), gave a somewhat simple explanation indicating that, cognitive style is displayed when two persons solve the same problem with different results.

According to Utto (1994), cognitive style represents dimensions of individual differences in cognitive sphere, where individuals remain relatively on a constant position. He sees those dimensions as characterizing the individual's variation in mental activity form. Hence, cognitive style is in principle, contextually independent of that activity. Saracho (1999) further noted that cognitive style is an aspect of personalized traits which comprise conformity, paths of pursuit, retention of information, one's approach to problems, and in tasks such as dispute resolution or information gathering.

Hartley (1998) described cognitive style as the ways in which different individuals characteristically approach cognitive task. According to Atkinson (2004), it is "a distinct and consistent way for an individual to encode, store and perform" (p.663), and is thus related to approaches in learning situations. The focus of style relates to behaviour, not the task itself (Furnham, cited in Saklofske & Zeidner, 1995). It can also be defined as the means of processing information, consistent with individual differences in experiences and perception; the manner in which information is organized; and the types of problem solving strategies employed (Martinsen & Kaufmann, 1999).

Further, Miller (1987) opined that cognitive styles are broad dispositions and higher order meta-strategies which are influential in an individual's quest to deal with circumstances. To Snow, Corno and Jackson (1996), cognitive styles are preferred or habitual strategies that are generalized across tasks. Sometimes, cognitive style has been used synonymously with learning style (Entwistle, 1981). Some contradictory views have been expressed by some who feel that learning styles are subject to change because they are just preferred strategies, whereas cognitive style is part of a person's personality and cannot change (Roberts & Newton, 2001).

In spite of the disparity in the choice of words, all the authorities that have defined cognitive styles converge on the idea of individual differences consistent in the way persons behave, organize and process information across tasks. In this study, cognitive style is described as the individual's consistent and characteristic predisposition of perceiving, remembering, organizing, processing, thinking and problem solving.

Reflectivity-Impulsivity Dimension of Cognitive Style

Educational programmes that are developed must accommodate unique abilities of individual learners. The innate abilities of students must be considered to accomplish this task. One of such innate abilities that affects teaching and learning is the cognitive style of learners.

Researchers have explored numerous dimensions of cognitive style upon which individuals are categorized. Witkin, Oltman, Raskin and Karp (cited in Child (1995), for instance, studied the cognitive style dimension of field-dependent and field-independent. They focused on the individual's dependency on a perceptual object when analysing a structure or forming parts of a field. Pask (1976) categorized individuals into 'holistics' and 'serialists' who display a tendency to work through learning task or problem solving incrementally or globally and assimilate detail.

Riding and Cheema (1991) made a distinction between 'holistic analytic' and 'verbal imagery' individuals, which centred on the tendency to process information in parts or as a whole and thinking in words or pictures. Individuals can also be categorized based on their preference for developing understanding through reasoning by spontaneity or insight and learning activity which allows active participation or passive reflection, conceptualized by Hayes and Allison (1996) as 'reasoning intuitive' and 'active contemplative'. Its bipolar nature implies an 'either or" measure, where the presence of one characteristic implies the absence of its extreme.

Over the years, various dimensions of cognitive styles have been proposed (Witkin & Ash, 1948; Witkin, 1950; Klein & Schlesinger, 1951; Messick 1966). These include field- dependence/independence, levelling/ sharpening, reflectivity/impulsivity, assimilator/explorer, verbaliser/visualiser, and so on. Sternberg and Grigorenko (1997) mentioned how they had classified extant work done on cognitive styles as falling into three major categories, which they referred to as cognition-centred, personality-centred, and activity-centred approaches. Cognition-centred styles resemble abilities and as such have often been measured by tests which count number of correct or wrong answers as measure of maximum performance. There was the need to move away from these quantitative means of assessment to a more qualitative means of how cognition functions. Two of the cognitive styles proposed which have generated the most interest and research are the field dependence- independence and reflectivity-impulsivity styles.

The cognitive style dimension of interest in this study was the reflectivity-impulsivity style identified by Kagan and his associates (1965) as the tendency for quick, not deliberate response. Kagan, Rossman, Day, Albert and Philips (1964) defined the concept of reflectivity-impulsivity style as a behavioural dimension which may be described as the degree to which an individual reflects upon the differential validity of alternative solutions in problem situations where several possible responses exist simultaneously.

Kangro (2011) pointed out that impulsivity is a behavioural construct that is generally associated with various psychological, social and health related outcomes, particularly problematic ones. Indeed, some researchers have provided strong evidence to the notion that impulsive patterns (i.e. tendency to behave on the spur of the moment without deliberation, planning and weak self-regulation capacity) are core aspects of hyperactivity (Barkley, 2006), certain types of aggressiveness (Fontaine & Dodge, 2006), risky health behaviours (Zapolski, Cyders & Gregory, 2009) and other irrational acts.

Yu (1997) described reflective individuals as fastidious and deliberate while impulsive individuals prefer to respond faster without accuracy. Squires (1979) defined the reflectivity-impulsivity style as a tendency to weigh a response before making it as against a tendency to respond in a hurry, which is sometimes referred to as conceptual tempo. Rozencwajg and Corroyer (2005) described the reflectivity-impulsivity style as a property of the cognitive system that combines individuals' decision making time and their performance in problem-solving situations, which involve a high degree of uncertainty. Cowie and Lewis (2009) described impulsive behaviour as marked by sudden action that is undertaken without careful thought.

Kagan (1965) was instrumental in the introduction of studies in the reflectivity/ impulsivity dimension, also called the conceptual tempo. Conceptual tempo refers to how a person typically behaves when faced with a choice from several alternatives. The reflectivity/impulsivity dimension of cognitive style measures the extent to which a child delays a response while searching for the correct alternative in a situation where there is uncertainty. Latency (the time between the presentation of the stimulus and its response) and the accuracy of the response, together constitute the measures of this cognitive style. Where the student is not sure of the response, some who are impulsive, will respond by quickly guessing without scrutiny of the alternatives, thereby making a lot of errors. On the other hand, reflective students will scrutinise and weigh the response choices carefully. Conceptual tempo may also be among learner characteristics that influence student performance on tasks that are complex and demanding, such as studying.

Kogan (1980) noted that the reflectivity/impulsivity dimension contains a characteristic tempo component (the speed with which information is processed), and an ability-like component (the efficiency with which that information is processed). Scoring formulas have been offered by Salkind and Wright (1977) for converting latency and accuracy scores into indications of style of information-processing and cognitive efficiency. The most common assessment instrument for measuring reflectivity-impulsivity is the Matching

Familiar Figures Test (MFFT), which was first developed by Kagan, Rosman, Day, Albert, and Phillips (1964). I found it convenient to stick to this norm as it has been so frequently and reliably used since Kagan. Where children have the same number of error scores on the MFFT, the more cognitively efficient child will be the one who responded faster. Prior research (Kagan, 1965; Erickson & Otto, 1973) have established a relationship between conceptual tempo and reading, especially relating to beginning tasks, such as word recognition, where response in decision is critical. Operationally, reflectivity-impulsivity typically has been measured by patterns of response latencies and errors on high speed and quite simple tasks that do not need much cracking of brains.

Kagan (1958), is of the view that conceptual tempo seems to be a relatively stable source of individual differences. However, there is contention as to whether impulsivity and reflectivity, as conceptualized here, apply only to situations of high response uncertainty (Kagan & Messer, 1975) or to a way of approaching life in general (Block, Block, & Harrington, 1974). Empirical finding about conceptual tempo (Glow, Lange, Glow, & Barnett, 1983) has distinguished impulsivity as a cognitive style as different from impulsiveness as a personality trait that was measured by Eysenck (Eysenck & Eysenck, 1975), thus one does not necessarily have an impulsive cognitive style because of an impulsive personality.

A considerable amount of literature which concern cognitive style focus on dichotomies, or bi-polar structures (Entwistle, 1981). The cognitive style dimension of reflectivity-impulsivity exists in a bipolar form just like many other stylistic dimensions of individual classification. For instance, Jung's extraversion–introversion, Kretsmer's, dissociate versus integration attention style, and Havey, Hunt and Schroder's conceptual systems theory (Child, 1995), all delineated individual classification, focusing on the amount of the characteristic of interest, present in the individual. So is the concept of reflectivity-impulsivity cognitive style.

The import of cognitive style dimension of reflectivity-impulsivity is thus, a matter of 'extent' or 'how much' and not whether or not. Thus, the dimension does not exist in an all or none basis. This is because, while some people display more reflective tendencies, others display more of impulsive ones, yet there are some people who cannot be found in the reflective- impulsive brackets; being neither impulsive nor reflective.

Kenny (2009) describes this bipolarity of the dimension which distributes people as illustrated in Table 1.

Table 1: *Reflectivity-Impulsivity Bipolarity*

<table>
<tr><td>Impulsive</td><td>Slow inaccurate</td><td rowspan="2">→</td><td rowspan="2">Median of
Number of errors</td></tr>
<tr><td>Fast accurate</td><td>Reflective</td></tr>
<tr><td colspan="2">↓</td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="2">Median Latency
(seconds to first response)</td></tr>
</table>

(Source: Kenny, 2009 p.53)

In Table 1, latency and accuracy scores were used to classify participants into four groups: (i) Impulsives: respondents who were quicker and whose latency scores were below median; (ii) Reflectives: respondents with latency scores above the median, and with fewer errors; (iii) Fast-accurates: fast and accurate respondents, and (iv) Slow-inaccurates: slow respondents with a higher error rate (Kenny, 2009). Thus, the measured cognitive tempo classified participants as impulsives (those who sacrifice accuracy for speed), reflectives (those who sacrifice speed for accuracy), fast accurates (those who sacrifice neither) or slow inaccurates (those who sacrifice both). The focus of this study was on those in category (i), children who show many impulsive characteristics, thus children who sacrifice accuracy for speed.

Reflectivity-impulsivity style describes people at one end of a continuum. The reason is that the classification of individuals into reflective or impulsive structures is done on the basis of response time and errors. Those who respond fast but make more errors are referred to as impulsive, while those who respond slowly and make fewer errors are categorized as reflective. However, there are individuals who respond quickly and nonetheless accurately, while there exist some others who respond slowly and yet inaccurately on the same task. For example, Schwabish and Drury (1989) classified their research participants into; reflectives (longer time, fewer errors), fast accurates (shorter time, fewer errors), impulsives (shorter time, more errors) and slow inaccurates (longer time, more errors), based on their scores on the Matching Familiar Figures Test. Watts (2011) studied the effect of visual search strategy and overlays on visual inspection of castings. He found out four groups of individuals; the reflectives, impulsives, fast accurates and slow inaccurates. In the sample used by Razmjon and Mirzaei (2009), the distribution of scores revealed 42 reflectives, 44 impulsives, 34 fast accurates and 10 slow inaccurates. Further in Rozencwajg and Corroyer (2005), the distribution of participants revealed; 5 fast accurates, 16 reflectives, 18 impulsives and 5 slow inaccurates.

Servera (1992), with regard to the relationship between reflectivity-impulsivity and personality, highlights the study by Block, Block, and Harrington (1974), who had studied cognitive styles with a focus on personality. They also identified four groups of individuals on the basis of the mean of errors and latency on the MFFT, namely, impulsive, reflective, quick accurate (impulsive-accurate) and slow-inaccurate (reflective-inaccurate). They also discovered moderate correlations between latency and personality, and high correlations for errors. They were however of the view that the latency variable related to the cognitive style component (reflective or impulsive), should have displayed a closer relationship with personality. They concluded that latency simply interacted with errors and should be taken as a variable in competence, and that the MFFT measured a capacity rather than a cognitive style. Later, Block, Gjerde, and Block (1986) replicated the study with similar results.

Victor, Halverson and Montague (1985) disagreed with the classification of subjects made by Block's team because they did not find personality differences. However, Block's team pointed out that in the slow-inaccurate group, correlates of impulsivity behaviour were observed mainly for errors. Cognitive and behavioural or motor impulsivity (related to hyperactivity) are independent dimensions evaluated by the Eysenck's Personality Questionnaire (EPQ). Cairns and Habirson (1975), Glow, Lange, Glow and Barnett (1983) also did not find any relationship between reflection-impulsivity as evaluated by MFFT and personality evaluated by the EPQ, including Eysenck's dimension of personality impulsivity. Finally, Bentler and McClain (1976) as well did not find high correlations between errors and latency in MFFT and personality, and so they concluded that reflection-impulsivity obeyed situational variables rather than personality traits, an explanation which is consistent with a cognitive position.

As personality refers to relatively stable characteristics of a person so may not be amenable to major changes, it may be safe to conjecture that an impulsive personality may not change, but an impulsive cognitive style, which is more of a trait is amenable to change to reflect current environmental demands. Whereas Clapp (1993) has presented evidence to suggest that cognitive style has longer term stability, others such as Zang (2013), argue that cognitive styles are more dynamic. Stahl, Erickson, and Rayman (1986) postulated that in contrast to people with reflective style, those with impulsive style get many errors on cognitive tasks such as reading prose, visual discrimination, inductive reasoning and serial recall tasks. People with impulsive personality trait usually do not feel much anxiety about making errors. They lean towards quick success to avoid failure, they have low motivation to perform or master tasks, and pay little attention to stimuli (Messer, 1970; Paulsen, 1978).

Many other studies have revealed other sources of group differences between reflective and impulsive children. These include health behaviour (Hofmann, Friese, & Wiers, 2008), perception (Kilburg & Siegel, 1973; Zelniker & Jeffery, 1976), creativity (Al Soulami, 2004), quality of decision making (Mann, 1973), intellectual performance (Brannigan, Ash & Margolis, 1980; Olasehinde, 1992), social reasoning (Bernfeld, cited in Razmjoo & Mirzaei, 2009) and in elaboration, originality and overall capacity for critical thinking (Frare, 1986).

Messick (1982) made a distinction between cognitive style and cognitive strategy. He postulated that cognitive styles are usually applied spontaneously in many different situations without conscious consideration or choice; cognitive strategies, on the other hand, manifest consciously as decisions among alternatives, and as a function of the conditions of a specific situation. This implies that strategies which are organized and selected, are also partly determined by the specific task and its situational requirements. In this regard, what may be a cognitive style for someone on one end of the polarity, may be a strategy for another on the other end (Kogan & Wallach, 1964, 1967). In other words, whereas reflectivity may be a style for a reflective student, it may be a strategy for an impulsive child.

As opined by Messick (1982), if cognitive styles are considered part of a person's personality and are fixed, strategies are more likely to be amenable to change through training under various learning conditions. With this view, it may be possible for someone to learn to use various problem-solving strategies that are in tandem with their style, but also shift to other strategies if the latter are more effective for a particular task at hand. The main purpose of this thesis was to examine the effects of some cognitive strategies taught to children, who from self, teacher and parents reports, may be characterised as impulsive, to improve their cognitive performance.

According to Kozhevnikov (2007), even though interest in building a coherent theory of cognitive styles remains at a low level among researchers in the cognitive sciences; investigators in numerous applied fields have found that cognitive style can be a better predictor of an individual's success in a particular situation than general intelligence or situational factors.

Symptoms of Impulse Disorder

A certain degree of impulsivity is common in children and even some young adults often display impulsivity in their behaviour. Only when present to excess and accompanied by problems with normal functioning is impulsivity considered abnormal in young children.

The signs and symptoms of impulse control disorders varies based on the age of the persons suffering from them, the actual type of impulse control that they are struggling with, the environment in which they are living, and whether they are male or female ("Impulse control disorder causes and effects", n.d.). It is often observed in those who suffer from attention deficit hyperactivity disorder (ADHD), which can affect adults as well as children and teens. Impulsivity can be manifested in an action or in interrupting a discussion, blurting out answers before someone finishes asking them a question, or the inability to wait one's turn at an activity. It is often accompanied by symptoms such as restlessness, impatience, hyperactivity, inattention and fidgeting, problems doing quiet activities, problems with executive function, talking excessively, having a hard time waiting to talk or react, have a hard time waiting for their turn, often interrupt or intrude on others enough to cause problems in social or work settings and start conversations at inappropriate times.

Impulsivity can, less commonly, be related to medical problems that interfere with an individual's cognitive function, such as stroke or dementia. The following are some more examples of different behavioural, physical, cognitive, and psychosocial symptoms that may be present in a child or adolescent suffering from an impulse control disorder: behavioural symptoms such as aggression, acting out in risky sexual behaviours, stealing, playing with fire and lying; physical symptoms such as the presence of STDs in adolescents who are participating in risky sexual behaviours, burns on the skin of children and adolescents who experiment or play with fire, injuries resulting from physical fights; cognitive symptoms such as agitation, irritability, difficulty concentrating, obsessive and intrusive thoughts; and psychosocial symptoms such as low self-esteem, social isolation, brief periods of emotional detachment, depression and increased levels of anxiety.

The Parents Handbook (2005) reported that children with impulsivity look normal physically and sometimes have normal behaviours. Conversely, they respond to stress by fidgeting, restlessness and distracted behaviour. If impulsivity goes untreated, the child can suffer a lifetime of emotional pain, frustration, academic underachievement or failure, as well as social isolation. In infancy, early indications of impulse disorder may be reflected in temperament. The baby may sleep very little or for short time intervals. When awake, he or she may be very demanding. Feeding problems such as poor sucking, crying during feeding, the need to be fed often for brief periods of time or difficulty settling into a comfortable sucking rhythm are early signs of impulsivity. Such children do become picky eaters sometimes. They also have the tendency of developing self-soothing behaviours such as excessive thumb-sucking, head-rolling, head-banging or rocking.

Once such children begin to crawl, they may be in constant motion with little regard to their parent’s presence or absence. They may be seen oblivious to and undeterred by parental warnings of danger. They are often vulnerable to accidents and hence require close supervision. It is difficult to maintain a daily routine with these children because they are so irregular.

Richfield (2005) indicated that, childhood impulsivity appears in decisions, actions and statements. It can be compared with a chemical accelerant that speeds up reactions to events. It is stored up and lives in a dormant form until something in the outside environment strikes. This can be thought of as a precipitant or trigger. Once the precipitant arrives on the scene, there may be a breakthrough in the form of aggressive actions such as hitting a friend, throwing a shoe or hostile comments such as belittling a family member. In the midst of such a breakthrough, there is little room for the voice of reason to be heard. Thus impulsivity narrows a child's perception, making it difficult for him or her to see the 'big picture'. It acts as a blindfold with a tiny hole in it. So much is blocked out except for the small space afforded by the hole. One can think of that as the strong feelings that block out everything else.

It is commonly known fact that toddlers and pre-schoolers are naturally active, most of them have short attention spans and many are fairly impulsive. Kaufmann (2005) for instance states that impulsive behaviour is normal in young children, but as they grow older, most learn alternative responses. Children later diagnosed as impulsive are those toddlers who ran instead of walking, always on the move and changing focus, and seem to be in perpetual motion without a goal or purpose.

Children who are overtly impulsive seem unable to curb their immediate reactions or think before they act. As a result, they may blurt out inappropriate comments or run into the street without looking. They may get angry and yell, throw or hit and they do not learn from experience because they cannot pause long enough to reflect before they act. These children according to Silver (1990) get into behavioural difficulties at home and school.

In the homes, they jump on chairs and tables attracting unnecessary attention and causing parents to be angry at their behaviour. In the schools, teachers are very conversant with these children who blurt out answers before waiting to be called. They mostly give wrong answers and teachers ignore them or call them names. Such children have difficulty entreating themselves and in playing with friends. They tend to be aggressive and are uncomfortable with unstructured independent works. They may even experience difficulty in structured activities like drawing or painting, simply because they find it difficult to remain seated or focus enough attention on one thing till they complete.

Melloy (cited in Ziporli, 2008) indicated that children who manifest impulsive behaviours often get into trouble in social situations, like games and play activities just because, they cannot wait for their turn. Ziporli (2008) stated that impulsive children rarely stop to think before they fully understand directions, they demonstrate remorse when their actions lead to mishaps and call out frequently in class usually with wrong answers. Dunn and Kronenberg (2005) also noted that, the behaviour characteristics of impulsive individuals often get associated with carelessness, laziness and rudeness which can influence interactions with adults and may lead to low self-esteem. They are highly aggressive both verbally and physically.

Schmint (2005) described impulsive people as impatient and who tend to interrupt others in conversation. They usually begin a task without enough planning and do not learn from experience because they cannot pause long enough to reflect before they act. Nwamuo (2010) reiterated that an impulsive child's school work may show lack of thought or focus. School papers and assignments are usually incomplete or full of errors. They usually have difficulty in social situations and have few friends.

Performance on Kagan's Matching Familiar Figures Test (MFFT), has also been used to indicate impulsivity in children. The test is able to discriminate between learners who, using longer time to respond, score higher on the test, signifying their reflective nature, and those who spend a shorter time to finish the test, but with many errors, signifying their impatience, lack of focus/concentration and subsequently, inability to choose the correct response when presented with similar alternate responses. Impulsivity is defined along two dimensions: response time and accuracy. Each child's mean response time for the items and the total error/accuracy score is compared with the group median for mean response time and error/accuracy. The group is defined as the total sample to which the Matching Familiar Figures Test is given. Impulsive children are those whose response time is faster and whose total errors are greater than the medians for the group.

Under normal circumstances, most children adjust their behaviour through learning so that they can enter into a game or a group project without interrupting the rhythm that has been established. However, children with impulsivity seem unable to regulate their behaviour to the demands of specific situations. They are likely to disrupt an established process. During play, they might push into games and conversations without being invited. They might run into other children, pushing, hitting and shoving despite the fact that they may not be angry, or have any malevolent objective in such behaviours which may eventually lead into quarrels and fights with other children (The Parents Handbook, 2005).

Olson, Bates and Bayles (1990) pointed out that, two year olds will begin to inhibit prohibited actions owing to remembered information but stated that self-regulation does not develop until the third or fourth grade of life. In this way, this study focused on class four pupils, who by the Ghanaian Educational Policy are within the ages of 8 and 11 years. These children were employed for the study because their age bracket is where impulsiveness is fully manifested and their parents and teachers have noticed their inability to stay in one place, finish assignments, obey instructions and accomplish tasks required of their age level (Nwamuo, 2010; Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016, Whitebread, & Basilio, 2012).

Potential Sources of Impulsivity: Biological or Environmental?

The biological or environmental debate has always been part of phenomenon in psychology. In view of the usually negative effects it has in the life of any individual, the source of impulsivity is of great interest. This part of the literature therefore seeks to subject impulsivity to the biological and environmental debate.

Impulsivity, as the tendency to act without foresight, has been associated with many psychiatric disorders, including addictions, attention deficit/hyperactivity disorder (ADHD), bipolar disorder and personality disorders. The fifth edition of the Diagnostic and Statistical Manual has also identified a group of psychiatric illnesses that are collectively defined as disruptive, impulse-control, and conduct disorders. These have impulsivity as a key feature and include intermittent explosive disorder (IED), pyromania, kleptomania and pathological gambling. Finally, impulsivity is associated with suicidal behaviour, aggressiveness and with certain forms of criminality. In recent years, the term impulsivity has come to be associated with several childhood behavioural problems, including aggression (Camp, Blom, Hebert, & van Doorninck, 1977; Feindler, Marriott, & Iwata, 1984), disruptive behaviour (Coats, 1979; Kendall & Braswell, 1982), peer relationship problems (Milich & Landau, 1982; Pelham & Bender, 1982), and other antisocial behaviours. According to the Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev.; DSM-111-R; American Psychiatric Association, 1987), impulsivity is an essential feature of attention-deficit hyperactivity disorder and is manifested by one or more of the following: blurting out answers to questions before they are completed, making comments out of turn, failing to await one's turn in group activities, failing to heed directions fully before beginning to respond to assignments, interrupting teachers or children, talking during quiet work periods, and accident-prone behaviour such as grabbing a hot pan from the stove. The *DSM-III-R* also includes impulsiveness as an associated feature of conduct disorder.

With reclassification in the DSM 5 of illnesses that are collectively defined as disruptive, impulse-control, and conduct disorders, “what we are left with is a group of disorders linked not by cause, which we don’t know, but by impulsivity and the harm they do to self and others.” (Odlaug, in Grant, Chamberlain, & Odlaug, 2014). For many years, experts have associated high levels of impulsiveness with behaviour problems. This impulsive behaviour is characteristic of children with attention deficit disorder and hyperactivity, but also of those which display antisocial personality traits that in extreme cases, can lead to violent behaviours. Odlaug also noted that many people with these impulse control disorders go undiagnosed and they may never find out they have a diagnosable problem. It is this undiagnosed group that I am particularly concerned about in this study; they are the ones from whom no one expects much because they are regarded as troublesome, or not serious with their schoolwork. They are the ones ignored by teachers as they move through the educational system.

No one particular cause has been known for impulsivity (Campbell & Werry, 1986; Kaufmann 2005), and various authorities point to a wide range of different areas including biological, social, complications at birth, environmental pollutants, and psychosocial as well as genetic factors. Researcher Kim (2014), intimated that the cause of behavioural disorders is probably a combination of genetics and environmental triggers with the frontal cortex of the brain where motivation is controlled being the most likely area affected. Most professionals believe that it is the combination of multiple factors, including genetic, physical, and environmental risk factors. Odlaug et al (2014) also noted that there is no consensus on causality, and it may be genes plus abuse or neglect with the frontal cortex and the limbic system being the most likely areas that cause the impulsivity. According to Bevilacqua and Goldman (2013), impulsivity is a multifaceted behavioural construct which may also be expressed in various forms, including aggression. They also noted that defining different forms of impulsivity could advance understanding of the neurobiological basis of diseases for which impulsivity is a component. They noted that impulsivity is a heritable, disease-associated trait, which may be useful as an endophenotype for gene discovery. They used multiple laboratory behavioural tasks and self-report measures to assess aspects of impulsivity, and found different neural circuits and genes, with pleiotropic effects on behaviour to modulate impulsivity.

Impulsivity, just like the disorders associated with it, is moderately heritable (Coccaro, Bergeman, & McClearn, 1993). A biological basis for impulsive characteristics was established by Alberts-Corush, Firestone and Goodman (1986), when they compared biological and adoptive parents of hyperactive and normal children. The test suggested a familial association between childhood hyperactivity and attentional deficits and impulse control problems and the biological parents. When measured with the Barratt Impulsiveness Scale (BIS-11) impulsivity, was significantly higher in siblings of stimulant abusers compared with controls (Ersche, Turton, Pradhan, Bullmore, & Robbins, 2010). Bevilacqua and Goldman (2013), postulate from their research that dopamine- and serotonin-releasing neurons are prominent in brain regions that regulate impulse control, and that dysregulated activity of the monoamine neurotransmitters has been demonstrated to be involved in impulsivity in neuropharmacological, gene knockout and genetic association studies. Barratt (1972), considers selected limbic input into the frontal and prefrontal cortex to be important in impulsiveness. Research news released from ScienceDaily (Nanyang Technological University, 2019), cited new findings on impulsivity that absence of serotonin receptors during early development leads to highly aggressive and impulsive behaviours in mice, and impulsivity returns to normal levels by reintroducing the receptors. Also other recent findings discussed show that weak control of the brain's prefrontal cortex (which monitors personality, decision-making, and self-restraint) over regions associated with reward and motivation could explain the lack of self-control experienced.

Local gyrification index (LGI) refers to the amount of cortex buried within the sulcal folds as compared with the amount of visible cortex in circular brain regions of interest (Zilles et al. 2013; Hirjak et al. 2016b). MRI studies on cortical gyrification suggested that genetic factors, pre- and perinatal brain development as well as family environment in which persons spent the first years of their lives, might have impact on LGI variations in humans (Nenadic et al. 2015; Zilles et al. 2013). Therefore, LGI variations are preformatted early in the life and remain stable into the adulthood. Cortical folding reflects a stable morphological feature of the brain that is not prone to state dependent effects, adult life events, medication, and other factors (Nenadic et al. 2015; Zilles et al. 2013). Researchers felt the analysis of cortical gyrification might provide complementary information regarding the exact nature of potential cortical changes in subjects with higher impulsivity which are thought to be determined before or around birth or in the early childhood. They used a correlative approach similar to previous MRI studies on impulsivity (Schilling, et al.2012, 2013b) to establish the relationship between LGI and impulsivity. Hirjak et al (2017) presented an original research aimed at exploring the relationship between impulsivity and cortical folding in healthy individuals' cortex. Among the findings, higher BIS (Barratt Impulsiveness Scale)-11 total score was positively associated with higher LGI in temporo-parietal regions. Also, higher BIS attention score was correlated with higher LGI in frontoparietal and occipital areas, and higher BIS non planning score was associated with widespread LGI changes in fronto-temporo-parietal regions. Also, higher BIS attention score was correlated with higher LGI in frontoparietal and occipital areas.

A study headed by researchers from the University of Murcia (Inuggi et al, 2014) analysed whether the connectivity of an infant's brain is related to children's impulsiveness. Parents responded to a series of questions related to their children's impulsive behaviour and the children were classified according to their levels of impulsive behaviour. Neuroimaging techniques were used to study the patterns of brain connectivity, and the results analysed to see if they were related to the level of impulsiveness that the parents had noticed in their children. They confirmed that the greater the level of impulsiveness in the children, the greater the alteration in the connections between the posterior cingulate cortex and the right angular gyrus, which is also observed in people with antisocial behaviour; and other cerebral areas that are usually activated when performing given cognitive tasks. The implications of the findings were that, what parents notice about their children's behaviour has a clear reflection in their cerebral connectivity patterns, and is useful information for checking what is observed on a daily basis on a neuro-anatomical level. Also, alterations in the connectivity between areas of the brain that were previously related with antisocial behaviour have been identified in children with normal development. Brain connectivity patterns can therefore serve as biological indicators for predicting the risk of the appearance of behavioural problems and social adaptation difficulties.

For a long time, impulsivity has been linked to the neurotransmitter dopamine. Dopamine regulates cognitive function, attention and responses to reward, all of which are factors in impulsivity. In a study published online

(Harmon, 2010), a team of researchers in neuroscience at Vanderbilt University, proposed that people who were more impulsive might have less active dopamine receptors in their midbrain but their brains would be more likely to fire off large quantities of the neurotransmitter when stimulated. The researchers used PET scans to watch the brains of healthy and psychiatrically normal subjects while they were taking a classic test to measure impulsivity. Before the first testing round, subjects had taken a placebo pill, but before the second, they were given an oral dose of amphetamine to stimulate the brain's reward pathways, mobilizing dopamine. People who had higher impulsivity scores had the lowest activity in the midbrain D2/D3 autoreceptors, which are in charge of receiving dopamine. But under the influence of the amphetamine, these impulsive individuals released much more dopamine than those who were less impulsive.

Impulsivity with its accompanying behaviours is a key symptom of ADHD. The editor of ADDITUDE magazine, Carl Sherman, featured some opinions on the cause of some ADHD researchers. Most ADHD researchers point to genetics and heredity as deciding factors for who gets attention deficit and who doesn't (Ruff, 2019). A biological approach (Nkrumah, et al., 2015) proposed that a specific gene for the serotonin receptor (5HT2A102) may play an important role in the regulation of impulses. The gene is involved in serotonin regulation, which is implicated in ADHD. People with two of these genes on paired chromosomes scored higher on personality tests for impulsivity than those with one or none of the gene (Kreisman & Straus, 2004). The serotonin receptor gene is associated with both hyperlocomotion and ADHD, as well as impulsivity. An explanation which also utilizes the biological approach is that foetal brain development is critical and undergoes complex and delicate changes; consequently, mothers who are in a negative emotional state, increase alcohol and nicotine intake, and increase food consumption may predispose their unborn babies having a decrease in central serotonergic activity in the brain, and may cause the child's future impulsivity (Halperin, Newcorn, Schwartz, Sharma, Siever, Koda, et al.1997; Nkrumah, Olawuyi & Torto-Seidu, 2015).

Physical causes of impulsivity may include an acquired brain injury or a neurodegenerative disease like Alzheimer's or Huntington's disease (Salters-Pedneault, 2019). In the event of brain damage that affects the prefrontal cortex (which regulates self-control and self-regulation), most patients are likely to exhibit disinhibition, which manifests as poor impulse control. Lack of vitamins such as niacin, pantothenic acid, thiamine, and vitamins B and C, have also been reported as being associated with impulsivity among children (Werbach, 1995). Electroencephalograph (EEG) and position emission tomography (PET) scans have shown that impulsive children have decreased blood flow, altered glucose utilization, and EEG activation (Woods & Ploof, 1997). Moreover, watching television for long periods of time, eating excess sugar, and poor discipline can also increase impulsivity (Nkrumah et al., 2015).

Recent studies on children and adolescents (Kim, Lim, Kwon, Yoo, Kim, Kim, et al., 2018; Rios-Hernandez, Alda, Farran-Codina, Ferreira-Garcia, & Izquierdo-Pulido, 2017) have showed elevated levels of ADHD symptoms (including impulsivity) as a result of diets high on refined sugars, soft drinks, processed foods instant noodles and lower intake of fruits and vegetables. Dysfunction of the dopamine (neurochemical) system is responsible for some symptoms including impulsivity (Winstanley et al., 2006). Moreover, Weed et al. (2011) and Barahmand et al. (2015) confirmed that children with SLD, as well as children with impulsivity, have impaired frontal/ prefrontal function, which Crews and Boettiger (2009) confirmed as overseeing behavioural control through executive functions, which include abstract thinking, motivation, planning, attention to tasks, and the inhibition of impulsive responses. Thus, it can be suggested that the achievement of children with Specific Learning Disabilities (SLD) is at stake because of their executive function deficits, as well as because of their impulsive temperament. Frontal/prefrontal lobe function is associated with a child's ability to solve problems; therefore, children with SLD who have average or above average intelligence may be unable to use their frontal lobe effectively, and any damage to the frontal lobe may affect a child's ability to project future consequences resulting from current actions, making decision making problematic (Brain Injury Institute, 2011; Centre for Neuro Skills, 2016). Thus, children with SLD and children with impulsivity may experience problems in determining similarities and differences between things and events, performance, social skills, the ability to read, and language and numeracy skills. Frontal lobe damage may also impair attention span, motivation, judgment, organization capacity, control of motor skills such as hand and eye coordination, conscious thought and emotion, and even personality (Brain Injury Institute, 2011; Al-Dababneh, & Al-Zboon, 2018). The prefrontal lobe is associated with planning, personality expression, and moderating social behaviour. It is involved in the orchestration of thoughts and actions in accordance with personal goals (Miller, Freedman, & Wallis, 2002).

Impulsivity in children with SLD may be associated with some of their inappropriate behaviours.

Ruff (2019), believes DNA is just part of the story, and is convinced that at least some cases of ADHD are a by-product of the fast-paced, stressed-out, consumer-driven lifestyles. According to Ruff, the prevailing cultural environment and modern way of life has an impact on the developing brain, in the sense that, lifestyle is on such a rapid tempo that today's children find it hard to adjust to the comparatively slow pace of the classroom, so they transfer the sense of urgency they have seen at home to their academic endeavours. According to L'Abate (1993), impulsivity may be a learned behaviour that is formed within the family setting. Children learn to react immediately in order to achieve what they desire from family and therefore those who are impulsive lack the ability to evaluate the consequences of their actions. Professionals in the field believe that children who have grown up in families or in homes where explosive behaviours, violence, verbal abuse, and physical abuse were common are more likely to develop impulse control disorders. Some children and adolescents may unconsciously find that engaging in such behaviours provides them with some sense of an escape from the chaos around them ("Impulse control disorder causes and effects" n.d.).

Inadequate mental stimulation by parents, lack of attention, rejection, or poor role modelling, can intensify signs of ADD/ADHD which are also signs of impulsivity. Researchers use the term "global neglect" to refer to deprivations in more than one domain that is language, touch, and interaction with others. For instance, children who were adopted from Romanian orphanages in the early 1990's were often considered to be globally neglected; they had little contact with caregivers and little to no stimulation from their environment-little of anything required for healthy development. Perry (2002) found that these children had significantly smaller brains than the norm, suggesting decreased brain growth. Images in Figure 2 illustrate the negative impact of neglect on the developing brain. In the CT scan on the left is an image from a healthy 3-year-old with an average head size. The image on the right is from a 3-year-old suffering from severe sensory-deprivation neglect. This child's brain is significantly smaller than average and has abnormal development of cortex.

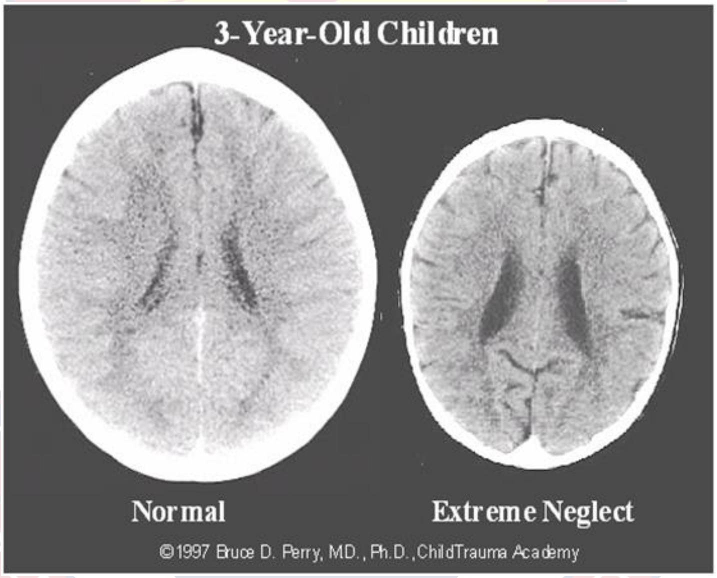


Figure 1: Global Neglect: Impact on the Developing Brain

Teicher (2000) indicated one major specific long term effect of abuse and neglect on the developing brain, as impairment in the connection between the two brain hemispheres, which has been linked to symptoms of impulsivity or attention-deficit/hyperactivity disorder. Woods and Ploof (1997) further indicated that parental malaise, marital discord, coldness to the child and over-criticism of the child may lead to impulsivity. Mothers of impulsive children tend to be less consistent, more impatient and power assertive. It is not a mystery to speculate that at least for some children, impulsivity emanates from their having predisposition to these behaviours which interact with psychosocial variables. Other psychosocial factors that expose children to impulsivity include but are not limited to, a chaotic home which fails to foster reflective behaviour, intrusive parenting style, and teachers' behaviour for instance with respect to classroom organization.

Olson (1990) and his colleagues conducted a longitudinal study to assess parent-child interactions through behavioural observation, to determine if parental style was a predictor of impulsive behaviour. Results indicated that, responsive, sensitive and cognitively enriching mother-child interactions are important precursors of childhood impulse control. Leve, Kim and Pears (2005) however emphasized that impulsivity is most likely related to some multiple factors such as childhood temperament, family environment, gender, and parental characteristics.

Galera, Cote, Pingault, Melchoire, Michel, Boivin and Tremblay (2011) conducted a longitudinal study to describe the developmental trajectories of hyperactivity-impulsivity and inattention symptoms, and to identify their prenatal, perinatal and postnatal risk factors among some 2,057 individuals from age five months to eight years. Results were that the frequency of hyperactivity-impulsivity symptoms tended to slightly decrease with age, whereas the frequency of inattention symptoms substantially increased up to age 6 years. However, trajectories of hyperactivity/impulsivity and inattention symptoms were significantly associated with each other. Risk factors for high trajectories of both types of symptoms were premature birth, low birth weight, prenatal tobacco exposure, non-intact family, young maternal age at birth of the target child, paternal history of antisocial behaviour, and maternal depression.

Impulsive behaviour may not always be maladaptive. It may be advantageous in situations in which it is important to respond rapidly and to take advantage of unexpected opportunities.

It is therefore empirically sound to postulate that the source of impulsivity is not exclusively the preserve of biology or the environment, both factors have immense differing effects on impulsivity. To wit, it is possible to have a child who is predisposed to impulsive behaviour, but might be more reflective because of positive environmental factors, or a child who is not biologically impulsive but might become so because of negative psychosocial factors. For now, the only consensus is that physical, biological, psychological, emotional, social and even cultural factors may all play a vital role in causality. Whatever the cause may be, the result causes inappropriate behaviours in the child. There is therefore the need for teachers, parents and caregivers to have knowledge on how to intervene with behaviour modification strategies proposed in this study, which can promote reflectivity in children.

Measurement of Reflectivity- Impulsivity Cognitive Style

a) Matching Familiar Figures Test (MFFT)

The Matching Familiar Figures Test (MFFT) is often used to measure the bipolar trait of reflectivity-impulsivity. The instrument was developed by Kagan (1966) with the primary aim to overcome the earlier test problems regarding IQ and memory. The test usually consists of 5-8 pictures: the variants, one identical to the standard picture and the rest slightly different in one detail each. The task of the participant is to choose the variant that matches the standard.

As the individual's error score on the test reduces, his response time increases. Reflective individuals have been identified as those who delay on the test, and make fewer errors. Alternatively, individuals with short latencies and high errors have been described as impulsive (Kagan, 1966; Agarwal, Tripathi & Srivasta, 1983; Buela-Casal, Carretero-Dios, de los Santos-Roig, & Bermudez, 2003; Rozencwaijg & Corroyer, 2005; Kenny, 2009).

The MFFT has proven reliable and valid in many previous studies in distinguishing between reflective and impulsive subjects. Egeland and Weinberg (1976), for instance, used the MFFT to classify research participants into impulsive and reflective groups. Results indicated that approximately 45%-75% of the participants classified as impulsive or reflective at time 1 were classified in the same way at time 2. However, the researchers indicated that reliability at the kindergarten level was particularly poor and therefore suggested the MFFT should not be used for children at that age.

Plomin and Buss (1973), confirming the MFFT as a performance measure, matched it with the Wechsler Intelligence Scale for Children (WISC) to find the correlation between cognitive style of impulsivity-reflectivity and intelligence. MFFT response latency correlated more positively (25) with WISC verbal scores, while it negatively correlated with WISC performance scores. Concerning the relationship between reflection-impulsivity and intelligence, they found there was no reliable relationship for Verbal IQ, but there was for Performance 1Q. Also, MFF error scores seemed to tap into similar abilities that were tapped by several performance subtests on the WISC. They concluded that the WISC clearly affected the cognitive style of children, pushing it toward the reflection end of the reflectivity-impulsivity dimension continuum.

Kagan (1985) the originator of the test accounted for the test-retest reliabilities of the MFFT (one-year retest interval) of approximately 0.62 for latency and ranged from 0.23 to 0.44 for errors. Similarly, Kirchner-Nebot and Amador-Carrpos (1998) reported that the MFFT presents moderate coefficients of internal consistency (0.77) for errors and high coefficient (0.94) for latencies.

Carre terro-Dios, De los Santos-Roig and Buela-Casal (2009), investigated the influence of the difficulty of the MFFT-20 on the assessment of reflectivity/impulsivity. They found out that, the difficulty level of the MFFT-20 is appropriate for children between 6-12 years. However, the item difficulty also revealed that the test is likely to show differences between children of 6 and 12 years. The fact that the MFFT is a non-verbal test makes it easier for use in different cultures subject to little or in some cases no modification. An adapted version of the MFFT-20 was developed and validated by the researcher and was used in this study.

b) Behavioural Ratings

Self-report inventories have traditionally been used for the basis of personality taxonomies like the BIG FIVE by McCrae & Costa (as cited in Child, 1995). Dickman and Meyer (1988) for example, found evidence for an association between impulsivity as measured by Eysenck's Personality Inventory (EPI) and a bias for fast inaccurate information-processing on cognitive task. Rothbart and Ahadi (1994) also reported a relationship between reflective behaviour, conscientiousness and agreeableness from the BIG FIVE. They contended that these relationships were the result of displaying what they called effortful control, or the ability to voluntarily sustain focus on task overtime.

Many other studies have used behavioural ratings to classify children into reflectivity and impulsivity categories. In Neitfield and Bosma (2003), participants responded to the EPI (Edwards Personality Inventory) and NEO PI-R (NEO Personality Inventory Revised) inventories upon which they were posted into reflective and impulsive groups.

Marsee, Silverthorn and Frick (2005) investigated the association of psychopathic traits with aggression and delinquency in a non-referred sample of boys and girls in the fifth through ninth grades. Psychopathic traits were measured with both teacher and self-report ratings, while aggression and delinquency were assessed through self-report ratings. Results showed an association between self–report psychopathic traits and both aggression and delinquency. Nwamuo (2010) gave behavioural rating scales (impulsivity questionnaires) for children, teachers and parents to respond to. Responses from the three ratings were tallied and the results were used to group children into reflective and impulsive groups.

This study used three adapted behavioural rating questionnaires. These were the National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale-Teacher Informant (NICHQ-VAS-TI), Checklist on Impulsiveness for Parents (CIFP) and Impulsive Related Questionnaire for Children (IRQFC). All three instruments were adapted from what was originally constructed by the American Academy of Paediatrics (2002), These rating scales were used to sample impulsive pupils for the study.

Empirical Review

Reflectivity-Impulsivity and Cognitive Problem Solving

Kagan (1965a) introduced the reflectivity/impulsivity dimension of problem solving to characterize and explain differences in children's problem-competence that are not accounted for by IQ or verbal ability, From a behavioural perspective, impulsivity may be defined as "a wide range of actions that are poorly conceived, prematurely expressed, unduly risky, or inappropriate to the situations and that often result in undesirable outcomes" (Evenden, 1999, p. 348). It can also be simply, described as the inability to delay gratification or the inverse of self-control (Monterosso & Ainslie, 1999). In the context of experimental behavioural science, impulsivity is commonly viewed as a trait shown by some subjects in that, when presented with a variety of outcomes, they choose poorer immediate rewards rather than greater delayed rewards (Ainslie, 1975). Ho and colleagues (1998) included in their definition, the importance of punishment, "the selection of small immediate gains in preference to larger delayed gains, or the selection of large delayed penalties in preference to smaller immediate penalties" (p. 362). Brunner and Hen (1997), Evenden (1999), Bechara, Damasio and Damasio (2000) and Bechara (2002) distinguished motor (or behavioural) from cognitive (or choice) impulsivity. The former is usually studied in animals and is equivalent to response inhibition.

Cognitive impulsivity, on the other hand, is considered as the inability to weigh the consequences of immediate and future events and, consequently, delay gratification. This has been measured in tasks of decision-making such as the Iowa gambling task (Bechara, Damasio, Damasio & Anderson, 1994). Lesion studies have suggested the ventromedial prefrontal cortex as the main area involved in this type of impulsivity (Bechara, 2002). Brunner and Hen (1997) further distinguish between an impulsive act (behaviour) and impulsivity which underlie psychological processes. Consider a person who knows the possibility of earning one of two rewards: a smaller one that is immediately available and another reward that is greater but not immediately available. The individual knows the existence of both options and chooses the first (impulsive act) because he/she is unable to delay gratification (impulsivity). The situation would have been quite different if this person chose the first reward because he was unable to evaluate each reward. In the latter circumstance, the behaviour would still be impulsive but the psychological process that led to the behaviour is the inability to discriminate reward amounts rather than the ability to delay gratification.

From a biopsychosocial perspective that attempts to combine the characteristic, cognitive and behavioural aspects, Moeller, Barratt, Dougherty, Schmitz and Swann (2001) pointed out that a general definition of impulsivity should include the following aspects: 1) decreased sensitivity to negative consequences; 2) rapid, unplanned reactions to stimuli before complete processing of information; and 3) lack of regard for long-term consequences. In the context of psychopathology, they defined impulsivity in three different ways: (1) “swift action without forethought or conscious judgment, (2) behaviour without adequate thought, and (3) the tendency to act with less forethought than most individuals of equal ability and knowledge”. Thus, impulsivity has been identified as a hallmark of some learning disabilities such as attention deficit hyperactive disorder (ADHD) (Barkley, 1997).

In a cognitive-behavioural context, Expósito and Andrés-Pueyo (1997) highlighted the relationship between impulsivity and information processing. Those subjects who were identified as more impulsive showed significantly greater response latencies than less impulsive individuals in a choice task. Additionally, the degree of impulsivity affected the response selection (or decision) stage but not the perceptual stage. The experiment provided some empirical evidence to the concept of impulsivity as a lost chain between knowledge and action (Loewenstein, 1996). The quest of this research was to investigate the use of cognitive strategies to bridge this knowledge-action gap.

Investigations of reflection-impulsivity (Kagan, 1965a, 1965b) have demonstrated its long-term stability, generality across varied task situations, and predictive validity to a variety of problem-solving situations. Problem solving is a process which starts as an identification of the problem, then exploration of information and generation of ideas, selection of the best idea, testing of the idea and then evaluation of the process. According to Kagan (1971), people differ in the evaluation stage of problem solving. Those who are reflective take more time than impulsives to weigh the correctness of their answers.

There are many other sources of group differences in the problem-solving process, including allocation of attention (Wright & Vlietstra, 1975), perception (Zelniker & Jeffrey, 1976), hypothesis generation and testing (Mitchell & Ault, 1979) In most instances, impulsives seem to focus more on the general information, and are less systematic in searching and comparing details. They also generate and test fewer hypotheses (Lawry, Welsh & Jeffrey, 1983). These have resulted in the lower performance of impulsive children on various tasks designed to bring out these differences.

Kagan's (1965) Matching Familiar Figures test (MFFT) sought to highlight the problem of individual differences on performance, given the fact that children in a class are all given the same problems and about the same time within which to provide solutions. In the MFF test, the subject's task is to select from an array of variants, one picture which is identical to a standard picture. Following an administration of the test (MFFT), children are operationally defined as "reflective" if they respond slowly and make few errors, or they are defined as "impulsive" if they respond quickly but with less accuracy. Though measures of cognitive tempo do not seem to correlate substantially with the traditional measures of intelligence, Messer (1976) reviewed 24 studies in which correlations with IQ are only marginally stronger for MFFT errors, with a median value of -.295 for boys and -.335 for girls. One of the main instruments for the assessment of reflectivity-impulsivity was the MFFT Form S, which contained two samples and 12 test items, each item consisting of a standard drawing of a familiar object with six variants pictured below it, only one of which was an exact duplicate, and in which the child was instructed to select the picture that was identical to the standard.

According to Carretero-Dios, De los Santos-Roig, and Buela-Casal (2009), even though some issues have been raised about the validity of the MFFT originally created by Kagan (1965), its new version, the Matching Familiar Figures Test 20 (MFFT-20) has demonstrated its reliability as an instrument for evaluating reflectivity-impulsivity and has led to its widespread use to overcome the shortcomings in the original MFFT. The MFFT20 have also provided support for the essential aspects of the scientific reliability of the reflection-impulsivity construct (Servera, 1992; BuelaCasal, Carretero-Dios &

De los Santos-Roig, 2001a, b; Buela-Casal, Carretero-Dios, De los Santos-Roig & Bermúdez, 2003; Carretero-Dios, De los Santos-Roig & Buela-Casal, 2009).

Lawry, Welsh and Jeffrey (1983), in a study on cognitive tempo and complex problem solving included the MFFT Form S along with a similar test, the Raven's Progressive Matrices, to evaluate both between- and within-group differences in problem-solving performance in children (age 9-11years), who had been identified as having reflective or impulsive cognitive tempos. The purpose was to map out the range of performance characteristics of the cognitive tempo groups by using a test containing problems which varied in conceptual complexity and difficulty, to explore between-group differences as well as within-group differences. They found no difference on response accuracy between reflectives and impulsive on items that were easy. However, as problems became increasingly difficult, differences emerged in terms of accuracy and latency. Reflectives performed more slowly and accurately, as impulsives responded quickly and inaccurately. Apparently, as impulsive children faced problems that clearly exceeded their abilities, they may have resorted to guessing. This was evident from the observation that their response choices were often among the most irrelevant distractors in the test. On the other hand, most reflectives continued to work on the more challenging problems in spite of low levels of accuracy, and their incorrect answers were often closer to the solutions than those chosen by impulsives. Latencies also increased generally as the items became quantitatively more difficult. As a result, Lawry, Welsh and Jeffrey (1983) suggested that reflectives may be learning something about a problem even if it is insufficient to generate the correct answer, and that it would be interesting to know what variables determine whether a child will give up or continue to try in the face of a really challenging task or failure. A more important point would be to ascertain whether the children made effective use of strategies available to them, rather than determining group differences in the quality of their problem-solving strategies. This study focused on impulsives and their effective use of specific problem-solving strategies, namely cognitive modelling, self-talk and a combined version of the two.

Ault, Crawford and Jeffrey (1972) found that teachers rated reflective third- and fourth grade children as higher in attention and lower in hyper-activity than impulsive children but not different in motivation to learn. McKinney (1975) also noted that teachers found reflective grade two subjects as more attentive and less distractable than impulsives. Glenwick, Barocas and Burka (1976) reported a relationship between MFFT performance and teacher ratings in fourth-grade boys, with the more impulsive boys being rated.as higher in acting outs, moodiness and learning difficulties. Similar results were found for girls, only on the ratings of learning difficulties.

Yando and Kagan (1970) in their study on the effect of task complexity on reflexion-impulsivity, found the dimension to be remarkably stable across problems with differing numbers of alternative responses, with the child's preferred approach to the task being a better predictor of both errors (for reflective children) and response time (for impulsive children) than task difficulty. They found that regardless of task difficulty, reflective children committed few errors; impulsive children responded quickly and committed many errors. These findings, together with the apparent stability of this dimension over a 10-week period, supported the notion that reflection impulsivity is an important characteristic of the child's psychological organization. They concluded that reflective children actively considered alternative hypotheses during their longer decision times, as earlier work has demonstrated that they make many more visual scans of the standard and variants than the impulsives (Kagan, Pearson, & Welch, 1966a). Moreover, the reflective children tend to examine all the variants before offering a solution; the impulsives often respond after examining only a few variants (Vurpillot, 1968; Nelson, 1968; Sigelman, 1966).

From a number of studies (Adams, 1972; McKinney, 1975; Mitchell & Ault, 1979), impulsives appear to be more sensitive to global contour information and less systematic in their search and comparative process, and they produce and test fewer hypotheses than reflectives. As a result, impulsive children have been shown to perform less well on a variety of laboratory tasks designed to highlight such differences.

Chandler (1977) and Shantz (1975) were of the view that a key assumption of social cognition research intimates that, processes which affect the way in which children think or reason about information constitute an important influence on their social behaviour. Researchers therefore explored the relationship between reflectivity-impulsivity and a variety of social reasoning tasks (Peters & Bernfeld, 1983).

Huston-Stein, Susman and Friedrich (1976) observed that “while cognitive style falls theoretically somewhere between cognition and personality, most of the research on reflection-impulsivity has been concerned with its relationship to cognitive performance” (p. 1). The question naturally arises as to whether individual differences in reflectivity-impulsivity are related to either performance on social reasoning or to differences in social behaviour.

Kagan and Kogan (1970) felt cognitive style investigators have generally tended to downplay the “critical and complementary roles of the social and impersonal environments” (p. 1352), and relatively little research has examined these questions. As well, except for Spivack and his colleagues (e.g., Spivack, Platt & Shure, 1976), few have stressed the necessity to distinguish between the reasoning processes required in personal and interpersonal situations. Researchers, without empirically justifying, (e.g. Camp et al, 1977) have assumed that cognitive impulsivity should be inexorably expressed as behavioural impulsivity.

In a social reasoning task from Schliefer and Douglas (1973), six-year-olds who demonstrated more mature forms of moral reasoning showed longer MFFT latencies and were rated by their teachers as more attentive and reflective than children showing immature moral reasoning. Moore, Haskins and McKinney (1980) studying 9-11-year olds, found no differences between reflective and impulsive children on a variety of classroom behaviours, including attending, distraction and aggression. Peters and Bernfeld, (1983) in a social reasoning task also presented first- and second -grade boys with a number of stories in which one of the characters was faced with a decision as to how to react to other people in a variety of conflict situations. A number of different types of responses were presented to the child in which he had to select the one which he considered more appropriate. Here, the researchers hoped to provide a more sensitive test of any differences in social cognition that might exist between reflective and impulsive children than that provided by previous research.

It seems both reflectives and impulsives adopted different strategies when confronted with difficult tasks. Campbell and Douglas (1972) found that reflective six to ten -year-old boys chose optimistic endings, while impulsives chose pessimistic endings, in a story completion test which aimed at eliciting responses to the threat of frustration. The investigators interpreted this to indicate an active attempt by the reflectives to modify the frustrating events, as opposed to either anger to deal with these events or a passive acceptance of the inevitable by the impulsives.

Cognitive Behaviour Modification: Modelling or Self-Talk?

Cognitive style has been the subject of numerous psychological studies over the past 60 years, and various topics in different areas including education, creativity, abnormal psychology, personality, child development, have all been studied. However, most of the research have focused on individual cognitive differences in perception, personality, and learning (Kogan, 1983). Research in the area of cognitive style is conceptually derived from the field of differential psychology (Cronbach, 1957) which has its basic belief in the fact that human beings have various unique, stable traits that are not subject to development. However, due to various works of Feldman (1980, 1983, 1985), data on individual differences including cognitive style can be viewed from another developmental perspective that includes within the same theoretical framework, the qualities which all human beings share that are subject to development as well as those that make them unique, but are also subject to development. Feldman's (1985) framework strikes a balance between the research on universal development and the research on individual uniqueness that guide understanding on the development of uniqueness. This framework can be helpful in understanding the development of child prodigies, or it can be useful in understanding the development of uniqueness in all humans (Gregory, 1989). One of such uniqueness in development is the impulsivity/reflectivity dimension of cognitive style. The focus of this study is mainly on the possibility of training impulsives to be reflective. Worthy of note is that early interventions appear able to reduce the severity and impact of these traits by increasing control over behaviour and persistence toward valued goals, such as educational achievement

Impulsivity has been subjected to numerous treatment strategies, most of which can be described as cognitive and/or behavioural. A number of studies have involved long-term classroom experiments or quasi-experiments (Brown, Pressley, Van Meter, & Schuder, 1996; Guthrie, Wigfield, Barbosa, Perencevich, Taboada, Davis et al., 2004), which sometimes lasted many months, or often a whole school year. They contrasted a traditional school curriculum that did not focus much on strategy instruction with curricula that taught students many different cognitive strategies. These studies have showed that with carefully designed instruction, students' performance on measures of learning, reasoning, and/or problem solving improved. According to Baer and Nietzel (1991), the precise effectiveness of these strategies in reducing impulsivity is unclear. They conducted a review to evaluate the treatment outcome literature on impulsivity in children using meta-analytic techniques to quantify many aspects of the literature. They had some limitations. They concluded that the impulsivity construct is inadequately defined, and its clinical significance is unclear, therefore selection of appropriate subjects for study will remain problematic. And even though the treatments for impulsivity in the literature could all be described as cognitive and/or behavioural, the numerous combinations of strategies made the identification of the most effective ingredients of these treatment packages unclear. This study sought to make a comparison among the intervention strategies used, to determine their effectiveness.

Results from another meta-analysis (Robinson, Smith, Miller, & Brownell, 1999) of 23 studies, however, provided strong evidence for the effectiveness of CBM in reducing the occurrence of hyperactive-impulsive and aggressive behaviours, contrary to that of Baer and Nietzel (1991). These researchers contended that CBM represents a good treatment match for both types of behaviour because its use can help students control their behaviour. Behaviour problems such as aggression and hyperactivity-impulsivity are often viewed as resistant to change, yet the studies indicated that interventions, including a cognitive component, can significantly reduce inappropriate behaviours of children and youth in school settings. They also noted that cognitive-behavioural interventions provide more sustainable results in reducing inappropriate and maladaptive behaviour after the cessation of treatment.

The commonalities underlying all of the behaviours studied as impulsive are high speed of response accompanied by many errors or inappropriate responses (Milich & Kramer, 1984). Because impulsive behaviours are often viewed as a result of failure to think about the consequences of responses or to consider alternative responses, impulsivity can be conceptualized as a cognitive deficit that may have a variety of behavioural consequences (Schleser & Thackwray, 1982). It is therefore not surprising, with this conceptualization, that cognitive and/or behavioural techniques are a popular treatment approach. Many treatment strategies for reducing impulsive behaviours have been reported. In studies attempting to modify the impulsive style, three main approaches that have been taken are instructing the child to delay responses and be more concerned about responding correctly, being given a model of reflective behaviour to emulate, and receiving training on effective information processing strategies to use before they respond (Eastman & Rasbury, 1981). Some of the strategies have proven to be very effective, others were effective and yet some others yielded no positive results.

This study explored the effectiveness of the method of cognitive modelling and self-talk strategies. These are among strategies that have been used by researchers to train impulsive children to delay gratification and become more reflective.

Cognitive Modelling Training and Impulsivity

Modelling is a form of observational learning in which adults or peers demonstrate to the client appropriate problem solving strategies. It is a behavioural technique used by clinicians and psychologists to modify the feelings and behaviours of a client by influencing the client's pattern of thought. Essuman, Nwaguo and Nwachukwu (1990) gave many variants of models such as live modelling, film modelling, symbolic modelling, behavioural rehearsal or guided practice and bibliotherapy.

Bandura (1969) pioneered the use of modelling to treat phobias, especially for fear of animals such as snakes and dogs. He identified four key processes that are crucial in observational learning as attention, retention, reproduction and motivation, processes which have already be reviewed in the theoretical review. Bandura (1969) pointed out that people have many learned responses that they may or may not perform, depending on the situation. Thus he distinguished between acquisition of a learned response and the performance of that response. He maintained that reinforcement affects which responses are actually performed more than which responses are acquired. People emit responses that they think are likely to be reinforced.

As part of the factors that facilitate the acquisition and performance of a modelled behaviour, Bandura the originator of the concept emphasized on the characteristics of the model, which include similarity to the observer in sex, age, and attitude. This is because, with similarity, the observer is assured that the behaviour shown is both appropriate to and can be attained by someone like himself or herself (Kanfer & Marston, 1963).

Studies have shown the effectiveness of modelling in behaviour modification. Nagle and Thwaite (1979) assessed effects of modelling on impulsivity. The thirty learning disabled, third and fourth grade impulsive children who participated in the study, observed a reflective model, showed significantly longer latencies and significantly fewer errors than subjects in both the impulsive and control groups following each treatment session and on the delayed post-test. Herman (1982) used peer modelling treatment to modify impulsive cognitive style among participants of his study. Results were that, there was improved academic performance in the area of reading, spelling and arithmetic. Gorrell (1993) assigned undergraduate students randomly to one of four experimental groups and provided them with two types of instructional procedures (direct instruction and cognitive modelling) and two types of rule presentation (explicit and implicit) of classroom management procedures.

When presented with hypothetical classroom management problems, subjects were expected to apply the behaviour analysis rules they learned. Results showed significant effects favouring cognitive modelling and implicit rule presentation on both problem-solving measures and self-efficacy measure.

Odoemelam (1994) used peer modelling to reduce behaviour problem and increase self-concept of her pupils. The treatment was effective on children with minor, mild and moderate behaviour problems. Further, Nwamuo (2010) employed cognitive modelling to modify impulsive behaviour of some primary school children. Results were that modelling was effective in reducing the impulsiveness of participants, and improving their academic performance, with the modified behaviour being sustained a month afterwards. Ridberg, Parke and Hetherington (1971) and Nkrumah (2013) also used cognitive modelling to train impulsive children to delay responses and improve their academic performance.

As it presents information in terms of an individual's emerging thinking processes, teaching relevant information and competent reasoning processes may be accomplished through cognitive modelling (Gagne, 1985). In cognitive modelling, an instructor or a model systematically and carefully reveals his or her thoughts and reasoning during the execution of a task. The learner is trained and encouraged to use similar thinking processes. Such modelling procedures have the potential for strengthening applicable rules by providing additional, personal associations that make the rules more relevant to the learner, by tying the examples presented in training to later problems, and by emphasizing similarities between training and transfer tasks (Gorrell, 1993). According to Pedersen and Liu (2002), externalization of these normally internal cognitive events allows students to see how an expert uses domain specific knowledge and a range of problem-solving strategies to perform tasks within a given context. This helps students to develop conceptual models of the processes that are required to accomplish the task. Through the provision of modelling, learners may work more effectively and experience less frustration.

Cognitive modelling has proved to be effective in increasing the use of constraint-seeking questions and improving problem-solving efficiency with 6-to-10-year-olds (Denney, 1975), increasing sixth graders' use of operational questions during science demonstrations (Allison, 1982), improving reading comprehension strategies with seventh and eighth graders (Bereiter & Bird, 1985), increasing accuracy in using division operations with 9-year-olds, and subtraction problems with between 8 to almost eleven years (Schunk, 1981; Schunk & Hanson, 1985), increasing anagram solving in a study of anxious female undergraduates (Sarason, 1973), developing better problem definitions by under-graduates (Cleven & Gutkin, 1988), and in increasing use by preservice teachers of relevant teaching strategies related to reading comprehension (Gorrell & Capron, 1990). In these studies, the learners were able to mentally place themselves in the position of the models when transferring the skills to later tasks (Gorrell & Capron, 1990; Welkowitz & Calkins, 1984). An interesting study by Pedersen and Liu (2002), used hypermedia program that offered modelling of pertinent strategies as students were engaged in problem-solving situations. While the classroom teacher could also model his or her cognitive processes for the class, presentation of this modelling through hypermedia had the distinct advantage of adding some excitement to the learning process. The result was that the cognitive modelling offered by the expert tool not only led experimental students to apply effective problem-solving strategies to their work, but in addition, it impacted the quality of their reasoning and their ability to present it in a convincing rationale for their solutions.

In addition to improving certain kinds of academic performance, cognitive modelling increases the learner's expectations of success or perceived self-efficacy in performing similar procedures because the higher one's self-efficacy beliefs, the greater one's persistence and effort in attempting to learn new skills, acquire new knowledge, or solve problems (Bandura, 1977, 1982).

These results suggest that simply providing tips and examples is insufficient to impact learners' actions or understanding; students do not apply advice and examples offered by an expert unless they see them modelled on activities similar to the ones in which they are engaged. With these successes, cognitive modelling was one of the strategies the researcher chose for this study, bearing in mind that no extra resources were needed to train in the strategy apart from the model (teacher or peer).

Self-Talk Training and Impulsivity

Another commonly used treatment is self-instruction also called self-talk training, patterned after the work of Meichenbaurn and his colleagues (Meichenbaum, 1977; Meichenbaum & Goodman, 1971). Meichenbaum, known for his book, *Cognitive-behavioural Modification: An Integrative Approach*, published in 1977, was one of the main proponents of cognitive behaviour modification (CBM). He advocated for people to change their negative behaviours, attitudes and beliefs, by changing their inner dialogue from negative to positive. This is done through an intervention that combines cognitive and behavioural learning principles to shape and encourage desired behaviours. The intervention is based on the assumption that a person's behaviour is interceded by cognitive events. A change in mediating events will lead to a change in the behaviour. The person therefore has to participate actively in his/her own learning and become his/her primary change agent. What people think or believe about themselves is what they verbalise. Examples include: I can't; I know I'll fail; what if I can't do it; this is too difficult for me; I don't feel like trying: I just want to do this quickly and leave- and such statements.

The usefulness of self-talk training has been demonstrated through studies with a variety of cognitive and behaviourally deficient target populations involving childhood problems such as impulsivity, hyperactivity, aggression, attention deficit disorders, learning and reading disabilities and so on. Rath (1998) found self-talk to be one of the most promising cognitive-behavioural treatment approaches in the remediation of childhood cognitive and behaviour disorder. Meichenbaum and Goodman (1971) added self-talk training to their study after they found that the accuracy score of their subjects had not increased after the first training in cognitive modelling. Peters and Davies (1981), assessed the effect of self-instructional training on cognitive impulsivity of twenty seven mentally retarded adolescents. The subjects received training in self-instruction while observing a reflective model or observed the model without specific training in self-instruction. Results showed that the self-instruction procedure produced significantly more reflective responses than the model procedure.

Luria (1961, 1982) and Vygotsky (1978) saw the use of language as a tool of thought which helps children to guide, plan and monitor their activities.

It helps the child to self-regulate, thereby transforming his/her cognition. There is significant evidence for the importance of children's self-regulation in their learning (Bronson, 2000; Matthews, Ponitz, & Morrison, 2009), and the self-regulatory role of children's self-talk provide grounds for a hypothesised link between children's self-talk and some aspects of their academic achievement.

Even though their study on the association between self-talk and Mathematical problem-solving strategies among 5–12-year-olds with and without Mathematical difficulties did not provide concrete evidence for the link, Ostad and Sorensen (2007) hypothesised that children's self-talk is linked to their Mathematical fact proficiency. Again, Ostad and Askeland (2008) found out in another study that eight-to-nine-year-olds who were trained on self-talk strategies performed better at Mathematical fact retrieval than a control group. Rosenzweig, Krawec, and Montague (2011) found that self-instruction, self-questioning, and self-monitoring directed and helped Mathematical problem-solving in a study of metacognitive verbalisation of eighth-grade students with and without learning disabilities. They found that self-verbalisations such as negative self-talk, expressions of confusion and frustration, and task-irrelevant self-talk were unproductive in facilitating Mathematical problem-solving using a think-aloud procedure. Studies by Berk and Garvin (1984), Goodman (1991), and Frauenglass and Diaz (1985) have found a child's self-talk to be consistently related to his cognitive ability in content as well as timing. Studies on self-talk have shown its positive effect especially when children have been trained to make use of it as a form of self-instructional strategy, rather than as their own spontaneous productions. Some studies showed performance is enhanced when children self-talk as they perform the action, however, when verbal self-instructions are given before the action, the speech is not as helpful in guiding behaviour (Wozniak (1975; Balamore & Wozniak, 1984; Goodman, 1991; Tinsley & Waters, 1982). Wozniak (1975) reported this phenomenon when he gave children a task that involved tapping sequences of coloured pegs with a toy hammer while listening to and/or producing various verbal instructions during or before tapping. Another research, by (Mischel & Patterson, 1976; Patterson & Mischel, 1975, 1976) also investigated preschool children’s instructed use of self-talk while trying to resist the temptation to play with attractive but prohibited toys. They found that children were able to resist or delay longer when they used the verbal strategies they were instructed to use, compared to control children who were either instructed to use irrelevant verbalizations or given no instructions. Cullinan, Epstein, & Silver (1977) reported an increase in MFFT accuracy in cognitively impulsive learning-disabled boys who were shown a video with a model using self-talk to accomplish a task.

Riviera-Flores (2015) trained children with ADHD to use self-talk to modify their impulsive behaviour. Post-test scores showed a statistically significant reduction in impulsivity percentile and in the number of errors, and a statistically significant increase in latency. This demonstrated the effectiveness of self-talk training in reducing impulsivity by getting them to sequentially organise their thoughts and to reflectively solve cognitive tasks.

A review of self-talk by Fuson (1979) pointed out that some researches have not shown the expected positive relation between self-talk and performance variables. Gaskill and Diaz (1991) however concluded that when certain methodological issues were resolved, the strategy was very successful.

These issues were about stating specific speech categories and specific performance variables, controlling for task difficulty and assessment on task improvement overtime. According to Diaz (1992), when people use self-talk in verbal communication, they are not talking to another individual but trying to control themselves, in that the speech helps them to mentally process task demands. For a researcher, this type of speech provides clues to such mental operations as focusing attention, planning, monitoring, self-motivating, pacing motor activity, while performing specific tasks.

Pourmohamadreza-Tajrishi, Ashori and Jalil-Abkenar (2015) sought to determine the effectiveness of verbal self-instruction on Mathematics problem-solving of ninth grade students with intellectual disability. The students who learned this strategy were able to show a high performance in Mathematics problem-solving tests. Considering the better performance of the experimental group in comparison to the control group, they concluded that verbal self-instruction had a positive effect on improvement of Mathematics problem solving performance in male students with intellectual disability. It seemed that verbal self-instruction led the students to use thinking skills for acquisition and retention of fundamental Mathematics facts. Therefore, they recommended that such learning strategies are taught to the students directly.

Alarcon-Rubio, Sanchez-Medina, and Winsler (2013) in a study went on to report that even adults use private speech with success. In their study of 126 illiterate adults enrolled in a public literacy programme, they were trained to use self-talk to perform a ‘‘school-like’’ task as a function of literacy. There was an experimental group with complete illiterate, and a control with advanced literacy level. Among illiterate adults engaged in the most difficult task, externalized self-talk was more frequently observed, just as in children. This externalised self-talk was found to serve cognitive functions as indicated by the proportion of self-regulatory self-talk. This is because the proportion of internal self-talk preceding actions, was higher in the advanced literacy group and among illiterate adults doing the easier task. The use of private speech in illiterate adults appeared to be linked to the mastery of cultural experiences, such as literacy, similar to the self-talk of children.

Lee and McDonough (2015), hypothesised in their study, that there would be a link between children's use of self-talk strategies that are self-regulatory in nature and their classroom Mathematical achievement. Their study however, unexpectedly, showed a lack of statistically significant correlation between the STQ (a self-talk questionnaire filled by the children in the study) and Mathematical achievement scores. This result is somewhat contradictory, given previous studies on the role of children's self-talk and its positive effect on their problem solving ability (Chiu & Alexander, 2000; Corkum et al., 2008; Winsler & Naglieri, 2003; Winsler et al., 2003). There may be some possible explanations for this phenomenon. Lee and McDonough (2015), felt that, given that these previous studies examined children's overt self-talk, it is possible that self-talk may have less of an impact on problem solving when it is largely internalised. Besides, the role of children's self-talk in relation to their problem solving is not always clear as previous studies show that self-talk increases with task difficulty and decreases when tasks are less challenging (Corkum et al., 2008; Winsler et al., 2003). It could be that self-regulatory self-talk had a little role to play in children's Mathematical achievement because the children had been taught other Mathematical problem-solving strategies, which they had become familiar with through classroom practice. Third, studies that demonstrated the role or positive effect of self-talk in relation to children's problem solving involved very specific tasks designed by the researchers. It is possible that the role or effect of self-talk in children's problem solving are task-specific and cannot be assumed to have the positive impact on classroom achievement and learning in general.

The verbal self-instructional training programme adopted from Padwar, Zupan and Kendall (1980), involved a step by step sequence which includes:

(a) the therapist models the task to be performed and talks out loud while the child observes (cognitive modelling),

(b) the child performs the task, instructing himself or herself aloud under the guidance and direction of the therapist (overt guidance),

(c) the therapist models the problem solving ability while whispering the self-instructions followed by,

(d) the child performs the tasks, whispering to himself (faded self-guidance),

(e) the therapist performs task using covert self-instructions with pauses and behavioural signs of thinking (e.g., stroking chin or raising eyes towards the ceiling),

(f) the child performs the task using covert self-instructions. The content of the verbalizations modelled by the therapist and rehearsed by the child includes several performance relevant skills:

(a) Problem definition ('what is it I have to do"?),

(b) Problem approach ("I have to look at all the possibilities")

(c) Focussing attention ("I have to concentrate and mind only what I am supposed to do),

(d) Coping statements ("if I make a mistake I can continue more slowly),

(e) Self-reinforcement ("Great, I did it, that was good")

In this study, similar procedure adopted from Meichenbaum and Goodman (1971) was used for the training in self-talk strategy.

Training in Combined Strategy and Impulsivity

Included in this study, and to provide a basis for comparing the strategies, was the third strategy which replicated the study of Meichenbaum and Goodman (1971), and sought to combine the relative strengths of cognitive modelling and self-talk to reduce impulsive behaviour and improve performance on cognitive tasks. The original study proved that whereas cognitive modelling slowed down the response time, it was the addition of self-talk training that resulted in reduced errors on the task. With the success in the above study, numerous other researchers proceeded to study combined methods to mitigate impulsive behaviour.

Cameron and Robinson (1980) trained hyperactive children on a combined strategy of self-instruction and self-management skills to modify their behaviour on on-task behaviour and Mathematics accuracy. There were significant changes in Mathematics accuracy for the subjects, with evidence suggesting generalization to untrained behaviours, seen by an increase in self-correction of oral reading for all subjects. The results suggest that cognitive-behavioural training specifically designed to promote generalization to classroom tasks can improve the classroom behaviour and academic performance of hyperactive children.

Fifty-five 8-11 year-old impulsive boys participated in the study by Orbach (1977), in which he used three different techniques - modelling and instructions, visual detailing and visual discrimination - designed to change impulsive cognitive style on response accuracy and response latency on the MFFT. The results showed that the two groups trained to increase response accuracy showed a significant decrease in errors and an increase in response latency. The “visual discrimination” group had a significantly shorter response latency than the “visual detailing” group. Subjects trained only to increase response latency did show a significant increase in latency; however, there was no decrease in errors.

In a study by Ammer (1983), sixty-nine hyperactive and underachieving, special needs students, eleven to sixteen years old were trained in cognitive modelling, self-talk and a combination of cognitive modelling plus self-talk with the intention of improving their attending-to-task and problem-solving skills. The MFFT was used to assess them just before training began, immediately after the training ended and again in a follow-up, four weeks later. Training sessions that included cognitive modelling had the discussion centred on acquainting each subject with appropriate ways to: stop, look, listen and think before selecting from the various alternatives. The five stage training process used for self-talk was the same as used by Meichenbaum (1977).

Olasehinde (1986) likewise trained two hundred impulsive students between the ages of 16 and 19 years. They were assigned randomly to one of three cognitive strategies - modelling with self-instructions (MSI), Self-Instructions alone (SI) and Programmed Instruction (PI). The study investigated the comparative effectiveness of the three training procedures for modifying the cognitive disposition of students given to cognitive impulsivity, using the Attitude Questionnaire, three parallel versions of the MFFT and three parallel multiple-choice tests in Mathematics and English language (AAT), and finally, the Ravens Standard Progressive Matrices. The results indicated that the three training procedures do not differ from one another statistically. However, the MSI procedure was the most effective for modifying impulsivity. In addition, the effects of the three strategies were found to be stable at a two-week delayed post-test. In a quest to modify impulsive tempo among twenty-four grade three children, Parrish and Erickson (1981) tested the relative effectiveness of two cognitive strategies- scanning strategy or self-talk. The results suggested that cognitive training in both strategies significantly affect impulsivity.

Similarly, in this study, the researcher expected the training in reflective strategies would generalize to other classroom subjects, such as the core English and Mathematics.

Impulsive Behaviour Modification and Academic Performance

During childhood, children are expected to develop cognitive, behavioural and social skills that are essential for school success as well as later adult living. Children need to learn skills for effective communication with their peers as well as adults, they need to learn how to pay attention in various situations and to follow rules. Barkley (1997) finds that for success in the acquisition of these skills, cognitive constructs such as inhibiting impulsive behaviour, self-regulation in which immediate gratification is delayed, responding to tasks in a manner that exhibits planning and problem solving, are essential. Therefore, impulsive children who are usually hyperactive and have attentional capacity and impulse control difficulties, are bound to, among others, have problems with learning and achievement. Lower class and "culturally deprived" children tend to be impulsive (Kagan, 1966a), however the inferior intellectual performance displayed by such children could be a result of an impulsive attitude, in addition to deficits in cognitive resources. Although impulsivity is not the sole cause of errors, a child who consistently attacks a problem with this preferred strategy may experience repeated failure.

Problem solving ability and solving problems have usually been the way to test performance in education. The most frequent areas of performance targeted has been in English and Mathematics (Kano, Ayana, & Chali, 2017; Ammer, 1983; Schunk, 1981; Olasehinde, 1986, Nwamuo, 2010; Cameron & Robinson, 1980; Ashori & Jalil-Abkenar, 2015). Gargallo, (1993) in his training of impulsive children used Mathematics and Spanish Language to measure academic performance of the children. He considered those two school subjects to be the most important in the primary school teaching curriculum because they are basic and necessary for the understanding of other subjects in the curriculum, also they have an uncertainty component and a reflective approach is needed to do the work and solve the problems they create. Normally the teacher expects students to solve problems that are similar to those already discussed in class or gives a problem to solve as an assignment to prime students for a coming new topic. The curriculum of each class group determines the level of problems that must be solved by students, and therefore would generally correspond to the age and cognitive ability of the students.

Schools in particular reward reflective individuals, at least so long as they are able to complete their work within the time allotted for a task. Impulsive individuals by their nature suffer greatly when it comes to standardized testing and classroom assignments. In many situations, however, MFFT performance has been found to correlate reasonably well with academic achievement (Haskins & McKinney, 1976).

In a study to indicate strategic and efficient performance on a problem-solving behaviour of children in grades two, four, and six in a pattern matching (PM) task, it was confirmed that reflectives were more strategic than impulsives (Cameron, 1984). A task-analysis assessment conducted identified the sources of inefficient PM performance to include failure to retain instructions, failure to formulate appropriate solution strategy, and failure to consistently implement a good strategy. The latter two were related to conceptual tempo in the sense that children who were more impulsive tended to report lower quality solution strategies, and if they formulated effective solution strategies, they did not consistently implement those strategies.

Not only was Cameron and Robinson's (1980) study successful, but the subjects achieved high accuracy in Mathematics which also generalised to other non-trained areas in oral reading. Most of the studies already mentioned in this research, have usually led to improvement in academic performance of children both with classroom impulsivity as well as clinical cases.

For Lawry, et al (1983), the question remains as to what extent processing differences between the two dimensions (reflectivity/impulsivity) influence performance across a variety of problem-solving contexts. The conditions under which speed and/or accuracy differences emerge have not been specified fully. For example, it is not known whether quick responding is generally indicative of impulsive performance in the majority of problem-solving tasks or only those that require visual comparisons. Similarly, it is not clear if slow responding is generally characteristic of reflective performance across problem-solving tasks that vary in difficulty and amount of analytic reasoning involved. The importance of any group differences must be assessed over the full range of performance observed within the groups.

Those required to bring about educational change have largely focussed on the curriculum and the value of classroom materials, while paying little attention to individual differences in children of similar competence. These people have been more concerned with the "what" the child is to be taught rather than the "how". Data suggests that modification of the decision strategy of the child may have subsequent effects on his problem-solving ability (Yando & Kagan, 1968; Kagan, Pearson, & Welch, 1966b), and finally of his academic achievement. It is urged that research in instructional and testing procedures acknowledge the significance of the preferred strategy of the learner for improved all-round academic performance.

Conceptual Framework

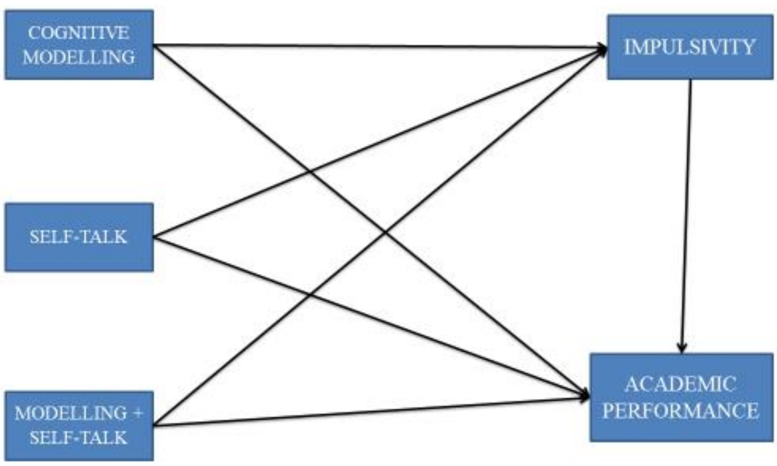


Figure 2: Conceptual Framework

The conceptual framework on which this research is based is depicted in Figure 2. The behaviour modification strategies of cognitive modelling, self-talk and cognitive modelling + self-talk were used to train impulsive children between the ages of 8 and 11 years in the primary school. These reflective strategies were to modify their behaviour by causing them to delay in their decisions and to make them reflect on their responses before they come out, thereby reducing impulsivity. This was to have effect on their academic performance in English and Mathematics. Then this would show the relationship between impulsive behaviour modification and academic performance.

Summary of the Literature Reviewed

Impulsivity has been described as a multifactorial construct that involves a tendency to act on a whim, displaying behaviour characterized by little or no forethought, reflection or consideration of consequences (VandenBos, 2007). Impulsive actions typically are poorly conceived, prematurely expressed, unduly risky or inappropriate to the situation that often results in undesirable consequences, which imperil long term goals and strategies for success.

A functional variety of impulsivity has also been suggested which involves action without much forethought in appropriate situations that can and does result in desirable consequences (Dickman, 1990; Daruna & Barnes, 1993). When such actions have positive outcomes, they tend not to be seen as signs of impulsivity but as indicators of boldness, quickness, spontaneity, courageousness and unconventionality.

Literature has it that impulsive individuals are associated with deficient problem-solving skills and negative behavioural characteristics. They are known for academic failures in many instances not because they are not intelligent, but because of their deficient thought processes. They also show deficits in social situations because of the negative behavioural characteristics they display (Melloy, cited in Ziporli, 1990).

Tracing to the roots of impulsivity, theorists delved into factors like biological, psychosocial, genetic, accidents and nutrition. All these theorists make sense in their disposition when analysed critically. However, impulsivity may stem from a single factor at a time or several factors may operate in an impulsive child concurrently.

Several studies have explored different methods of modifying impulsivity in children which served as foundation for correcting impulsive behaviours in children. The methods of modelling and self-talk were of interest in this study because of the nature of subjects (children) the researcher dealt with. Children are known to learn greatly by imitation; hence an impulsive child viewing a reflective model is likely to imbibe the reflective adult's style of solving cognitive problems.

While some studies have confirmed the effectiveness of modelling and self-talk in behaviour modification, its effectiveness on Ghanaian children has rarely been explored. This study therefore explored the effectiveness of cognitive modelling and self-talk among Ghanaian children.

CHAPTER THREE

REAEARCH METHODS

This chapter presents the procedure used in carrying out the study. It provides information on the research design, population, sample and sampling techniques, the instruments and their validation procedures. Further, the procedures for treatment and control of extraneous variables, as well as procedure for data collection and methods of data analysis are explained.

Research Design

The study adopted a quasi-experimental approach. This design allows me to randomly select a sample from the population but does not require the random assignment of individual cases to the comparison groups. The quasi-experimental design was deemed appropriate for this study because the pupils were already constituted in their various classes by the school administrations and I worked with these intact groups already existing in the school clusters (Frankfort-Nachmias & Nachmias, 2004). I chose to use the Solomon Four Group Design in particular, because it is appropriate for experimental and quasi experimental studies. The Solomon Four Group Design involved pretesting some groups, but not others, and giving intervention to the experimental groups. Finally, all the groups are post tested to ascertain the effect of the intervention. The various combinations of tested and untested groups coupled with the treatment and control groups allowed me to ensure that confounding variables and extraneous factors do not influence the results (Spector, 1981).

The Solomon four-group design has the advantage of being able to assess the presence of pre-test sensitization, in which exposure to pre-test increases the sensitivity of the subject to the experimental treatment. This hinders the generalization of results from the pre-test sample to a non-pre-tested population (Huck & Sandier, 1973). This design adds a higher degree of external validity to its internal validity, and according to Helmstadter (1970) it is "the most desirable of all the...basic experimental designs" (cited in Walton Braver & Braver, 1988, p. 110).

Despite its strength, the Solomon four-group design does not seem to be a frequently used design, and this may be due to some factors. The design requires doubling the number of groups used by other designs which may create inconvenience for some researchers. Some researchers also may not have interest in examining pre-test sensitization effects and so would not want to use a design in which this is a requirement. Moreover, because the design permits a number of comparisons at the same time, it may present conclusions which are rather complex and complicated and may deter researchers. A really important reason for it being underused may be the uncertainty of the proper statistical treatment. Walton, Braver and Braver (1988) proposed the meta-analytic approach. According to Rosenthal (1978), meta-analysis demonstrates how the results from disparate, independent tests of the same hypotheses may be statistically combined even when the significance tests arise through different statistical techniques. The design is presented in Table 2.

Table 2-*Solomon 4 Group Design Illustration*

Test group	pre-test	Treatment	post-test
1	O_1	X	O_2
2	O_1	-----	O_2
3	-----	X	O_2
4	-----	-----	O_2

Key

O_1 – Pre-test

X – Intervention

O_2 – Post-test

In this study there were four intact groups involved. They were however randomly assigned to control and experimental groups. Two groups [one control and one experimental] were pre-tested [1 and 2] but the other two groups [one control and one experimental] were not pretested. The two experimental groups received treatment whereas the control groups received placebo in creative activities, drawing and colouring. All the groups were post tested after eight weeks of intervention and exercises. It must be noted that each intervention strategy had four groups- two experimental and two control as displayed in the design. Put another way, each reflective strategy had a Solomon 4 design. Hence, a total of 12 groups were involved in the study.

Study Area

The study took place in the Northern Region of Ghana, specifically the Tamale Metropolis. Tamale is one of the fastest growing cities in Ghana. I have lived and worked lived in Tamale for a while and so access to the schools and familiarity with the environment made it convenient to select Tamale for the study. Another important reason for using Tamale was that the primary school population there has not been involved as much in research as the primary schools in the southern parts of Ghana, who may have research fatigue. For instance, probably the only research in cognitive style modification that has been conducted in Ghana (Nkrumah, 2013) as already indicated, was conducted in the Southern part of the country. The choice of Tamale metropolis was therefore prudent to bring research in cognitive style modification to a different destination.

Population

The population for the study was all primary four school children in the Tamale Metropolis. At the time of the study, there are 278 primary schools with an enrolment of 76,320 pupils. The target population of primary four pupils was of interest because according to the literature (Nwamuo, 2010; Whitebread, & Basilio, 2012; Ziv, Benita, & Sofri, 2017), even though development of self-regulation begins early in life, it is from the age range of eight to eleven years (most of whom are likely to be in Primary four in the study area), that impulsivity may be fully manifested. In addition to this, parents and teachers would have noticed children's inability to stay in one place, finish assignments, obey instructions and accomplish tasks required of their age level.

There are twelve clusters of schools in the Tamale. Schools are clustered within a particular zone in the metropolis and have similar characteristics. Three clusters were purposively selected, as well as seven primary schools within these clusters .This was because access to the school children, as well as the acquaintance of some staff was important for the study, given the fact that the selected schools and staff had to be willing to use regular school time for the needed interventions in the study. The accessible population was 615 primary four children from seven schools in the three selected clusters in the Tamale Metropolis.

Since the study was interested in a specific group of children within this population, the parents of the 615 primary four children were considered as part of the population because the parents were needed to fill questionnaires for their children to enable me identify the impulsive ones. Teachers of the children were also involved in helping to identify those children with impulsive tendencies. In precis, although the population of interest was the 615 primary four children, there was an additional population comprising of 615 parents and 12 teachers with the peripheral function of helping to identify the sample for the study. In all, a total of 1,242 participants were involved in identifying the impulsive children by ticking responses on the screening tools (behavioural rating scales) used for the study. Table 3 describes the breakdown of the accessible population.

Table 3-*Breakdown of Accessible Population*

Population	Male	Female	Total
Children	267	348	615
Parents	206	409	615
Teachers	6	6	12
Total	479	763	1,242

Sample and Sampling Technique

A sample size of 275 primary four pupils (127 males, 148 females) with impulsive characteristics was used for the study. In the determination of sample size in experimental design, Roscoe (1975) reiterated that in behavioural research, a sample size of not less than 30 and not more than 500 is acceptable. Hair, Black, Babin, and Anderson (2010) also proposed five subjects per variable to be analysed as the lower limit, but a determination of ten samples to one variable to be more acceptable.

From the Metropolitan Education office, I was given the number of the school clusters in the metropolis, in addition to the number of schools in each cluster. There were twelve clusters and I conveniently selected three clusters out of the twelve for the study. These three clusters were selected because of ease of access to the schools therein. The three clusters contained four school streams each, so there were twelve intact classes available for the study. Three groups of persons namely, the primary four children, their parents and their teachers were involved in the selection of the sample for the study by filling out the various behavioural rating scales which were used as screening instruments. The class teachers filled the National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale- Teacher Informant (NICHQ-VAS-TI) for each pupil in their class. The children were then guided to complete the Impulsive Related Questionnaire for Children (IRQC) under the supervision of the class teachers, the researcher and her assistants. The parents also completed the Checklist on Impulsiveness for Parents **(**CIFP) for their children. Pupils who obtained the required total scores needed to diagnose a person as impulsive all the three scales, were selected as the sample. In other words, for a child to be considered impulsive hence a subject in the study, he / she would have been rated as impulsive (based on the required scores from the behavioural ratings scales) by himself/herself, the teacher and then by the parent.

A total number of 275 pupils out of the accessible population of 615 primary four pupils were considered as impulsive based on the results from the three rating scales. Out of a total male population of 267 in primary four from the seven schools, 127 were deemed impulsive and were selected as subjects for the study. The total female population in primary four was 348, and out of this number, 148 qualified as subjects for the study. The number of males and females described here belonged to the different schools from each cluster. Table 4 describes the total number of subjects from each cluster as well as the number from the various schools in each cluster.

Table 4-*Pupils Selection from School Clusters*

School Clusters		Primary four pupils			Number Selected		
		Male	Female	Total	Male	Female	Total
1. Bagabaga Dem Prim A							
	(A)	28	33	61	19	19	38
	(B)	28	31	59	16	15	31
Bagabaga Dem Prim B							
	(A)	15	23	38	5	13	18
	(B)	22	25	47	8	14	22
Sub total		**93**	**112**	**205**	**48**	**61**	**109**
2. Bishop's Primary A							
	(A)	21	39	60	11	12	23
	(B)	29	30	59	15	12	27
Bishop's Primary B	(A)	22	39	61	9	9	18
	(B)	20	32	52	12	13	25
Sub total		**92**	**140**	**232**	**47**	**46**	**93**
Tishegu Anglican PrimA							
	(A)	29	28	57	12	14	26
	(B)	18	22	40	8	9	17
Tishegu Anglican Prim B		19	22	41	6	10	16
Tishegu Anglican Prim C		16	24	40	6	8	14
Sub Total		**82**	**96**	**178**	**32**	**41**	**73**
GRAND TOTAL		**267**	**348**	**615**	**127**	**148**	**275**

Data Collection Instruments

The instruments employed for use in this study were either adopted, adapted or developed by the researcher. In view of this, all the necessary validation procedures were duly followed to authenticate the instruments used.

The instruments were tested for validity and reliability before use. The reliability and validity of an instrument are important indicators of the quality of the instrument. Kimberlin and Winterstein (2008) asserted that reliability estimates are used to evaluate (1) the stability of measures administered at different times to the same individuals or using the same standard (test–retest reliability) or (2) the equivalence of sets of items from the same test (internal consistency) or of different observers scoring a behaviour or event using the same instrument (interrater reliability). A test will be deemed reliable if it yields the same or close to the same score for a person each time it is administered (Detterman, 2009). Validity is the extent to which the interpretations of the results of a test are warranted, which depend on the test's intended use (i.e., measurement of the underlying construct) (Kimberlin & Winterstein, 2008).

There were three groups of data Collection Instruments:

A. Screening tools:
   a. National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale-Teacher Informant (NICHQ-VAS-TI)
   b. Checklist on Impulsiveness for Parents (CIFP)
   c. Impulsive Related Questionnaire for Children (IRQC)

B. Training Programs:
   a. Training in Cognitive Modelling
   b. Training in self-talk.
   c. Combined Training in Cognitive Modelling and Self-Talk

C. Assessment Tools:
   a. Matching Familiar Figures Tests-20 (MFFT-20)

b. Academic Performance Tests (APT) in English Language and Mathematics

c. Treatment Program Evaluation Questionnaire (TPEQ)

The screening tools as well as the MFFT 20 assessment tool were tested for content validity by giving it to an expert paediatrician, an educational psychologist and a primary four class teacher for their hints. The final draft of the instruments was constructed factoring in opinions and suggestions of these experts. The pilot testing for the instruments were conducted in Savelugu primary schools. They are in a district outside Tamale that share similar characteristics with the schools in the Tamale Metropolis. The reliability tests for the NICHQ-VAS-TI and CIFP were performed by 20 primary school teachers and parents in the Savelugu township. Reliability tests for the IRQFP and MFFT-20 were done by 120 pupils from primary four schools in Savelugu. To determine the reliability of the items on the questionnaires, Cronbach Alpha (α) was used to estimate the internal consistency of the sub-sections of the instruments. An alpha value of .70 or above was considered appropriate (Karagoz, 2016). The instruments and treatment packages used in the study are described below:

a. **National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale- Teacher Informant [NICHQ-VAS-TI (Appendix D)]**

This instrument was adapted for the study. The original document is a standardized instrument used by teachers to rate the behavioural characteristics of pupils at school and it is suitable for diagnosing early signs of impulsivity. The NICHQ-VAS-TI was developed by the American Academy of Paediatrics (2002). It has an already established reliability coefficient of $\alpha = 0.82$. The instrument was again tested for reliability to confirm the authenticity of its use in the current ecology. A test-retest reliability was conducted with the instrument in the other clusters that were not selected for the main study. The reliability obtained after the three weeks test retest was $\alpha = 0.80$. The NICHQ-VAS-TI is a 23-item questionnaire with three sub-sections (A, B and C). Section A gathered information about teacher's name and some demographic information on the pupil. Section B had items that took information on signs of impulsivity in children, while Section C gathered the teacher rating of the child's academic performance as well as classroom behavioural pattern. Items in Section B were constructed on a 4-point Likert scale of 'Very Often-3' 'Often- 2', 'Occasionally- 1', and Never-0'. The teacher put a tick in the column that described the child. A positive response rating was one that fell under point 2 or 3 (often or very often). The child needed to score at least 10 positive responses in this section in order to participate in the study. Section C had a set of performance measures on a scale 1 to 5, with 4 and 5 being indicators of problem/problematic conditions. To qualify in this section, the child needed to score at least 4 points (thus one problematic or somewhat of a problem response).

b. Checklist on Impulsiveness for Parents (CIFP)

This instrument was adapted from the National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale- Parent Informant. The CIFP is a standardized psychological instrument that was adapted and used by Nkrumah (2013). It had a reliability coefficient of $\alpha = 0.79$. The instrument was further adapted in this study due to minor language difficulty (observed in Nkrumah, 2013) which led to rewording and addition of examples to make it easier for the parents to understand the characteristics of interest. The reliability coefficient obtained after the modifications was α = 0.81. The CIFP was used by parents to measure pupils' behaviours in their homes (Appendix E). The scale consisted of items that corresponded to various characteristics of impulsivity which children display in their homes. The parent was to tick the column that described the child under assessment. The CIFP was made up of two sections. Section A sought for the parent's demographic data. Section B had 20 items on characteristics of impulsivity designed on a four-point Likert scale as follows: Never-0, Sometimes-1, Often-2 and Very Often-3. The scale was put on a 0 to 60 continuum. To qualify on this scale, the child needed to score at least 30 points.

c. Impulsive Related Questionnaire for Children (IRQC)

This is a self-report, pencil and paper questionnaire that was developed and used by Nkrumah (2013). The IRQC had a reliability coefficient of α = 0.80. It was adopted for this study for the pupils to rate themselves about their own behaviours both at home and in school (see Appendix F). The instrument was used without modification because the language was suitable for use by the children under study and the instrument was detailed enough to collect the needed information. The IRQC was divided into two sections. Section A collected demographic information about the children. All the items in Section B were rated as 'often or sometimes', of points 2 and 1, respectively. The pupils ticked in the column that they felt matched their personal descriptions. The items added up to a maximum score of 40 and a minimum score of 20. To qualify on this scale, the child needed to score at least 30 points.

d. Matching Familiar Figures Tests-20 (MFFT-20)

The MFFT-20 was adapted by the researcher from the one used by Kagan 1985) and Al Silami (2010). This version was used because according to Carretero-Dios et al (2009), it demonstrates its reliability (α = 0.91) as an instrument for evaluating reflectivity-impulsivity which has led to its widespread use because it has overcome the shortcomings in the original MFFT. After pilot testing it had a reliability of 0.82.

The MFFT consisted of many items each of which was similar to a standard figure. For each figure called the standard, there were five other figures called variants. Although the five variants were very similar to the standard, only one was exactly the same as the standard. The task of the pupil was to select from among the variants the one figure that matched the standard. Each test consisted of twenty items. It was reconstructed in this study to include many more items for use as pre-test, post-test and delayed post-test. In constructing the test, pictures of different objects that were known to be familiar with Ghanaian children from the environment were selected. The arrangements of the identical variants were randomly assigned from item to item. Three versions of the MFFT-20 were created and used in the study. In all there were sixty items grouped into three as: MFFT-20 (I), MFFT-20 (II) and MFFT-20 (III). The MFFT-20 (I) was used as pre-test, MFFT-20 (II) was used as post-test, and MFFT-20 (III) was used for the delayed post-test (sample in Appendix H).

e. Academic Performance Tests (APT) in English Language and Mathematics:

These tests were developed by primary four teachers who were outside the selected schools used in the study. This was to control for biases in setting questions that would favour a particular class. There were two sets of teacher-made performance tests in each of the subjects (English and Mathematics) that were used to test problem solving skills of all pupils. A study of the scheme of work from all the different schools revealed they were all on the same topics. The tests were prepared using the curriculum for primary four and the approved textbooks as well as the scheme of work. This was to ensure all the students were on the same level with regards to the topics treated by their teachers, and that they were within the ability range of all the pupils. Pupils took these tests before and after intervention to determine a change if any, on their problem-solving abilities in these subjects.

f. Treatment Programs Evaluation Questionnaire (TPEQ)

This instrument was designed and used by Nkrumah (2013) to assess the experimental groups' views about the training programme they completed and was adopted. The questionnaire had 13 items divided into two sections; A and B. Section A consisted of pupils' demographic data whilst B had items that assessed pupils' experiences about the programme (see Appendix G).

Training Programs in Reflectivity

There were training programs in cognitive modelling and self-talk that were adapted for use in this study. The researcher trained selected teachers on how to use the strategies in the classroom. Below are summaries of the training programs. They were used for the English and Mathematics lessons:

a. Cognitive Modelling Training Procedure

i. The cognitive modelling training procedure employed here was designed and used by Nwamuo (2010), adapted and used by Nkrumah (2013). The later version was used because it was in sync with the educational system in Ghana. The training procedure engaged pupils on observation skills and in reflective problem solving skills in which they had to make careful comparison among and between objects based on properties (such as weight) and physical features (such as colour, shape, size); grouping and sorting similar objects and identifying similarities and differences among objects based on common characteristics; sequencing events; putting together parts of a whole, and so on. Close observation to give as detailed a description of objects as possible was emphasized. They were shown videos of impulsive children and the behaviours they put up, such as blurting out incorrect answers before being called, finishing exercises quickly but with many errors, making careless mistakes, impatience in having to wait their turn, and a discussion was held on the causes and effects of such behaviours based on the scenarios.

They were then asked to describe some other distracting behaviours, for example, looking out of the window, leaving their seats, playing while others were working, not following instructions as they were given. To break these behaviour chains, they were encouraged to listen attentively in class as they could be called by the teacher at any time to respond to questions.

ii. Pupils were guided to rehearse the procedure in the reflective problem solving skills of the trainer and feedbacks were immediately given to them.

iii. Pupils were praised for their efforts and encouraged to improve where there were mistakes.

iv. Those who did not observe, imitate and perform the task appropriately were made to delay for a short while before being allowed out for their break. The teachers discussed with them possible reasons why they could not complete the given tasks.

v. Progress verification was conducted as new tasks were given and subjects were called to demonstrate the procedure to be followed in front of the class. They were rewarded for minimal errors and they were asked to observe and correct their errors.

vi. They were then encouraged to observe carefully and think things over, using the reflective problem-solving procedure before they engaged in any task.

vii. There was progress verification of review of cognitive modelling skills, problem-solving and questioning, encouragement and rehearsal.

vii. Post-test was given to measure whether learners had benefited from the instruction.

b. Self-Talk training Procedure

This training program was designed originally designed by Meichenbaum (1977) and redesigned by Orjales (2007). It was adapted for use by the researcher for the purpose of this study. It was similar to the training for cognitive modelling, only that the pupils were encouraged to verbalise as much as possible as they performed the various problem-solving tasks. Teachers were taught to guide the pupils through the following sequence of activities:

i. The teachers demonstrated how the class exercise was to be performed by talking out loud. They modelled questions about the nature of the tasks, discussing out loud relevant aspects of the tasks and talking about possible answers to these questions while the pupils observed.

ii. The teachers completed the tasks while still talking to themselves as pupils observed as closely as possible how the actions and verbalizations were performed.

iii. Some pupils performed the same tasks on the board while the teachers instructed them aloud.

iv. The subjects were then asked to perform the tasks again with the instruction to verbalize their actions and thoughts just as the teacher had done and reinforced themselves. For example, the child was instructed to verbalize "What am I to do here?" .... "I need to take my time." "I have to do it carefully." "Have I done it the way teacher showed us?" 'I think I have done the right thing, now let me see the next one."

v. The pupils were told by the teacher to try the next tasks alone using the same procedure while talking to themselves (using low tones or by showing lip movements).

vi. When pupils performed the tasks in front of the class, the class participated by prompting when some steps were missed out.

The verbalizations which teachers modelled, and pupils subsequently used included:

- Questions about the nature and demands of the task to make sure there was no deficiency in comprehension;

- Answers to these questions in the form of cognitive rehearsal and planning to overcome any possible deficiency in producing the required responses;

- Self-talks in the form of self-guidance while performing the tasks to overcome any possible mediation deficiency; and

- Self-reinforcement.

The following is an example of teacher's modelled verbalizations which subjects subsequently used:

"What is it I have to do? Teacher says I should copy the picture with the different lines. I must do it slowly and carefully. I draw the line down, down like this, good; then to the right, that's it; now down a little more. Okay, I think it looks ok. Even if I make a mistake, I can cancel it and do it again slowly and carefully. Okay, I should go down now. Finished. I did it."

It is to be noted that in this example, an error in performance was included and appropriately accommodated. The verbalizations varied with the demands of each task, but pupils were trained to produce a narrative description of their actions as they performed any given tasks.

c. Combined Training Procedure in Cognitive Modelling and Self-Talk:

i. This training package combined and adapted the strategies outlined in cognitive modelling and those of self-talk. The subjects that received this training were exposed to the same modelling behaviour by the teacher as were the subjects in the modelling-alone group.

ii. In addition, they were also trained in the self-talk procedures that the teacher used while performing the same task for the whole class to see.

iii. After the teacher modelled on a task, individual pupils were instructed to perform the task while talking aloud to themselves as the teachers had done.

iv. The participants were then put into groups, each group given similar tasks. They practiced modelling as well as production of self-talks as they performed the tasks.

The researcher extended the previous activities by including the following activities:

v. A member from each group then went to the board to model the problem-solving technique, while giving a narrative of their actions (like the teachers did) as they performed the task before the class.

vi. Each participant was then encouraged to use the same procedure in doing their individual tasks given them.

vii. Teacher praised those overtly talking through their tasks.

Data Collection Procedures

The researcher obtained an introductory letter from the Department of Education and Psychology of the University of Cape Coast to the Tamale Metropolitan Director of Education in September 2016. The researcher sought for ethical clearance from the Ethical Review Board of the University of Cape Coast (see Appendix A). The Director of Education of the metropolis gave the researcher a letter that introduced her to the heads of schools in the selected clusters. The researcher met each of the school heads for permission to do the research. Upon receiving of permission, from the school heads, a meeting was scheduled with the primary four class teachers where their consent was sought for their involvement in the study. The researcher trained a team of four (4) research assistants to help with the collection of the data.

The initial stage of the data collection involved the class four teachers whose duty was to complete the NICHQ-VAS-TI for the pupils in their classes. The teachers were given a period of two weeks to fill the questionnaires for each pupil in their class. After the teachers had finished filling the questionnaires, the researcher visited the schools to get the pupils to complete the IRQFC. The researcher explained the biodata followed by each question and its options to the pupils who then rated themselves, one question after the other, by ticking the option they felt related to them. The various class teachers helped with translation of the items on the questionnaire into the local language to ensure that the children clearly understood what they were doing. Parents of the class four pupils also completed the CIFP. The parents at scheduled PTA meetings were informed about the research. They were assured of anonymity of the information obtained and were also informed that they could withdraw their children from the research any time they felt like doing so. They gave their consent and a week was scheduled for them to come to the school to complete the CIFP and consent forms for their children. The parents visited the schools and they were individually assisted by the trained research assistants to rate their children on the behavioural rating scale (the CIFP). The involvement of the research assistants in the filling of the CIFP was necessary because the pupils' school records showed that majority of the parents were either illiterate or semi-literate. The researcher or the assistants read the questions one after the other and translated them into the local dialect for the parents who could not read and assisted them to tick their responses.

Scores on the three ratings scales; NICHQ, CIFP and IRQFP were analysed and pupils who got the required scores on all the three instruments were deemed impulsive and they constituted the study's sample. The scores on the instruments in order to qualify for participation is illustrated in Table 5.

Table 5-*Scores on Instruments for Subject Selection*

Instrument	Total Score	Min Mark	Max Mark
NICHQ-VAS-TI	23	14	23
CIFP	60	30	60
IRQC	40	30	40

Table 6 shows the means by which impulsive subjects were selected using the behavioural rating scales.

Table 6-*Subject Selection Using Rating Scales*

Description	**NICHQ**	**IRQFP**	**CIFP**	**NICHQ, IRQFP & CIFP**
Qualified respondents	297	281	278	275
Disqualified respondents	3189	334	337	340
Total respondents	615	615	615	615

Simple random sampling was used to assign each of the twelve school groups to either experimental or control group, giving a total of six experimental, six control groups. Out of the selected pupils from the research sample, one experimental and one control group per treatment were given pretest. The pretest was conducted with the MFFT-20 I. All the experimental and control groups were also given performance test in English and Mathematics. The training of pupils then started. The control groups were given placebo in creative arts exercises and drawing. With the three experimental groups, one received training in cognitive modelling, another one received training in self-talk and the third group received training in cognitive modelling plus self-talk. The training session lasted for a period of eight weeks. The contacts periods for both the experimental and control groups was one hour a week, three times in a week. The training sessions were done during school hours.

Allocation to Treatment

The study was not directed at any particular sex because impulsive characteristics is not gender specific, and as a result, all pupils within the appropriate age range who scored the required marks on the behavioural rating scales were included in the study. Put another way, all the impulsive pupils, indiscriminate of their sex, were involved in the study. Since the researcher was working with intact groups, the researcher randomly assigned the classes into treatment and control groups. There were 12 groups of control and experimental groups for the study (see a breakdown in Table 7).

Table 7-*Allocation to Teaching Strategy Groups*

GROUP	No. of Pupil Participants			% of
	Male	Female	Total	Participants
Group 1: Cognitive Modelling				
Experimental 1	11	12	23	24.7
Experimental 2	9	9	18	19.4
Control 1	15	12	27	29.0
Control 2	12	13	25	26.9
Total	47	46	93	100
Group 2: Self Talk				
Experimental 1	16	15	31	28..0
Experimental 2	8	14	22	20.9
Control 1	5	13	18	16.5
Control 2	19	19	38	35
Total	48	61	109	100
Group 3: Cognitive Modelling + Self Talk				
Experimental 1	12	14	26	35.6
Experimental 2	8	9	17	22.0
Control 1	6	10	16	23.3
Control 2	6	8	14	19.1
Total	32	41	73	100
Grand Total	127	148	275	
	(46%)	(53.8%)	(100%)	

The distribution of the sample per strategy is illustrated in Table 8.

Table 8-*Assignment of Pupils to Strategy*

TEACHING STRATEGY	NUMBER OF PARTICIPANTS	PERCENTAGE
Cognitive modelling	93	33.8
Self-Talk	109	39.6
Cog. Mod + Self-talk	73	26.5
Total	275	100

All experimental one and control one groups were given pre-test with the MFFT-20 I, while experimental two and control two groups were not pretested. All the groups (both experimental and control), pretested and non-pretested, received academic performance tests in English and Mathematics. The training of pupils then started. The six experimental groups (three pretested, three non-pretested) either received intervention in self-talk, cognitive modelling or a combination of self-talk and cognitive modelling with reflective thinking. The control (six) groups received the placebo. Following the training sessions, the subjects were all given post-test. The post test was conducted with the MFFT-20 II. They were also given performance tests in English and Mathematics (described herein as English 2 and Mathematics 2). The scores on the pre-test were compared with those on the post-test and suitable analysis were conducted to assess the changes that had occurred in the subjects, if any. The researcher then waited for three weeks after the post-test to conduct a delayed post-test. Within the three weeks, there was no contact with the subjects. After the three weeks, the researcher gave all the pupils the delayed post test using the MFFT-20 III only. The essence of the delayed posttest was to assess the sustainability of the treatment variable following the cessation of treatment. Finally, the subjects filled out the Treatment Package Evaluation Questionnaire (TPEQ) to register their impression about the research.

Control of Extraneous Variables

Experimental research generally differs from other forms of research because of its peculiar features and sensitivity. A major issue of concern when carrying out any experimental research is the control of other variables other than those the researcher is interested in so that any change in the dependent group (problem solving abilities of impulsive children) could be attributed to the sole effect of the independent variable (reflective teaching strategies).

Extraneous variables are those variables that the researcher does not manipulate but may affect the outcomes of the experiment. It can produce uncontrolled changes in the value of the dependent variable, hence make it difficult or impossible to detect the effect of the independent variable. To identify a clear causal relationship between the independent and the dependent variable, a researcher should control the effect of extraneous variables (Bordens & Abbot, 2002). This could be done by holding the extraneous variable constant or by distributing its effects across the treatment in such a way that the effect cannot be mistaken for the effect of the independent variable. The following steps were taken to control extraneous variables in this study:

a. In order to control for the effect of intelligence on the results, the items on the MFFT were familiar objects in the pupils' environment (see Appendix F) which every child could identify and respond to. Notable however, the researcher was also careful not to use overly familiar objects in order to avoid the contagious effect of perceptual fluency.

b. Venues for the control and experimental groups' activities were strictly kept apart. The classrooms of the control groups were quite far (about two kilometres from the experimental groups although they belonged to the same cluster. The aim of this was to prevent contamination (that could emerge from interaction among pupils) between the control and treatment groups' activities.

c. All groups that were pre-tested used the same questions (MFFT 1 and the Academic Performance Tests). As well all groups, experimental and control, responded to the same post-test and delayed post-test. This was to make the groups as homogenous as possible, hence only the treatment package differed so that any difference could be attributed to the sole cause of the treatment package.

d. All three MFFT 20s were trial tested in a different town. The academic performance tests were also prepared by primary four teachers who were not teaching in schools taking part in the research even though they contained questions from the curriculum as at the research period for the term.

e. To reduce the extent of experimental mortality, participants were given files, exercise books, pens and crayons; thus, all items they needed on the training to encourage their punctuality. More so, time for the activities was incorporated in the school's regular time table, so that children needed not to be in school before normal lessons or stayed in school after normal school hours.

f. Novelty, in experimental research could create unnatural behaviours. For instance, the extent that a child may pay utmost attention to the model if the model is an unknown person could affect the research results. Hence, the researcher herself did not train the children. The teachers of the pupils were given thorough training on how to use the therapies and they served as models for the study.

g. Finally, appropriate statistics were used for the analysis of the data collected. The analysis using Solomon Four Group Design allowed for the elimination of initial differences on several variables between the treatment and control groups.

Data Analysis

All instruments were scored and collated. Results that did not fully meet the study requirements were taken out. Such results included those for pupils who were not scored or partially scored on the rating scales but took other tests. The researcher and an assistant initially entered the data for all participants onto excel worksheets. Information had to be entered and coded according to types of intervention, experimental or control, pre-test or no pre-test.

What the researcher aimed to do was to find out the effects of the three intervention strategies on the problem-solving abilities of the impulsive pupils. The first eight hypotheses were analysed with between and within group MANOVA. Hypotheses one to three had two dependent variables – MFFT and Response time. Hypotheses four and five were analysed with one-way MANOVA because it used the gain scores (the difference between the pre-test and post test scores) from hypotheses one to three as dependent variables. Hypotheses six to eight also had two dependent variables of Mathematics and

English scores. Hypothesis nine was analysed with Pearson Product moment correlation coefficient. It had Mathematics and English performance as dependent variables.

The two-way between groups MANOVA was used to test the effect of treatment on problem solving abilities of the students. The problem solving ability was measured with the dependent variables of MFFT accuracy and response time. Two groups were pre-tested, while two were not pre-tested. This therefore meant the two independent factors in the analysis were experimental treatment and whether pre-test was administered or not. A significant interaction indicated a need to separate the pre-tested groups from the no pre-test groups for further analysis and control for pre-test effects. Procedure for the analysis of Solomon 4 design used in the study is shown in Figure 3.

Pearson Product moment correlation coefficient was used to measure the relationship between the impulsive behaviour modification (measured with MFFT accuracy and response time) and academic performance in Mathematics and English Language.

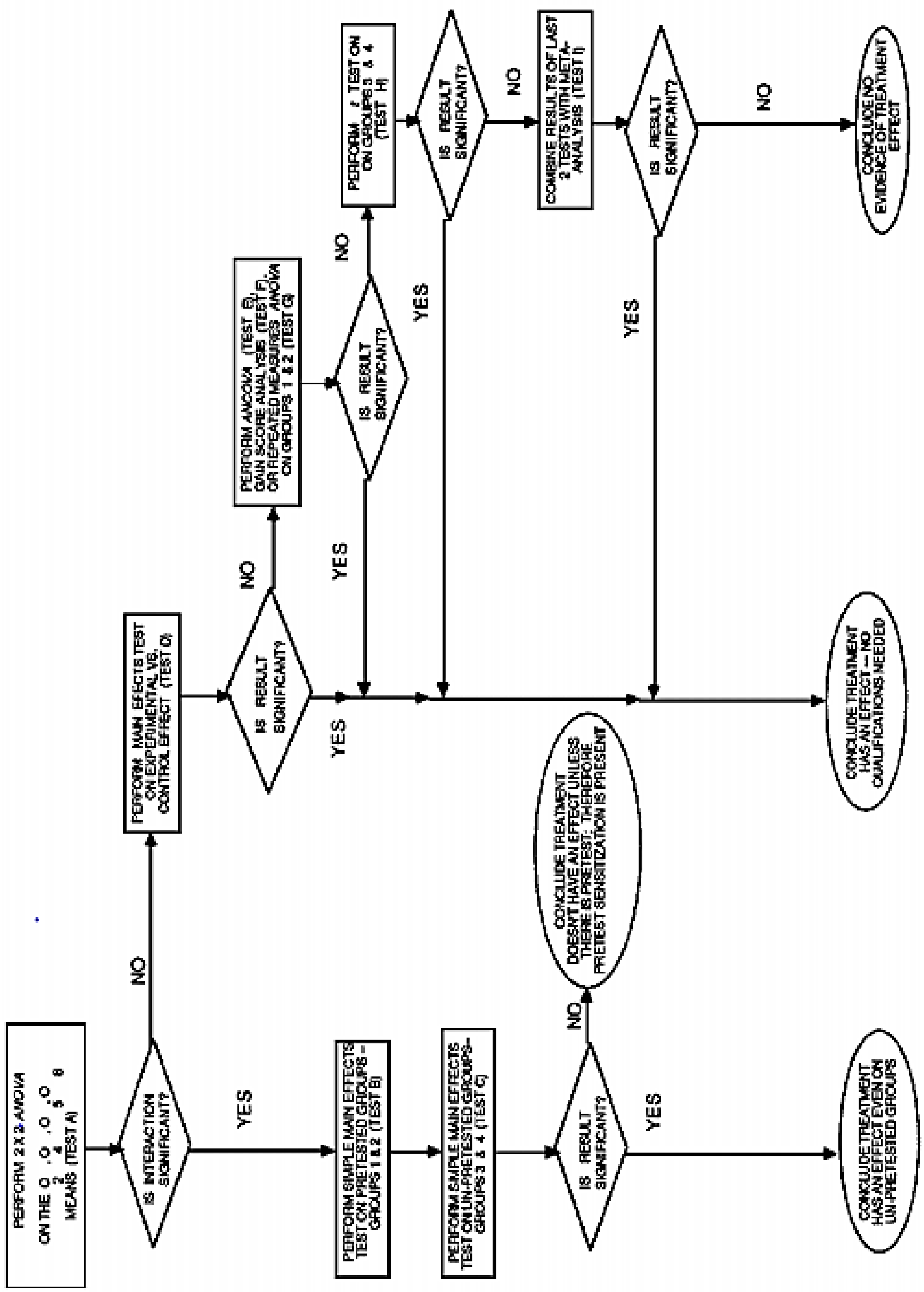


Figure 3: Solomon 4 analytical procedure: adopted from Walton Braver and Braver (1988)

Summary

This chapter presented the method used to obtain the sample for the study, the instruments used as well as a description of the instruments used. It also featured details of the intervention training. Procedure for analysis was also provided.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the results that were gathered from the experiments conducted as well as discussion on each hypothesis tested. The discussions are presented after the results of each hypothesis. Finally, a summary of the chapter that knits the results together is presented.

The study was guided by nine research hypotheses. The primary statistical test used to test the hypotheses is the Multivariate Analysis of Variance (MANOVA). This is an appropriate test because of the use of multiple dependent variables to control for error variance and control for Type 1 error because of the multiple dependent variables.

Both multivariate and univariate results were interpreted for the first eight hypotheses. Hypothesis nine was tested using Pearson Product moment correlation coefficient. It tested the relationship between the measures of impulsivity (MFFT accuracy and Response time) and academic performance.

Hypothesis one

There is no significant effect of cognitive modelling on the problem-solving abilities of impulsive children.

A two-way between groups MANOVA was used to test the effect of cognitive modelling training on the problem-solving abilities of the pupils. Problem-solving ability in this study was measured with the MFFT accuracy and response time. Thus, there were two dependent variables. Four groups were involved in this strategy. Two of the groups were pre-tested, while two were not pre-tested. The two independent factors in this analysis were experimental treatment and whether pre-test was administered or not.

Table 9 illustrates the means and standard deviation for the treatment and pre-test factors.

Table 9-*Descriptive Statistics for MFFT 2 and RTIME 2 for Experimental and Pre-Test Factors*

	Experimental or Control	Pre-test or no pre-test	Mean	Std. Deviation	N
MFFT 2 SCORE	Exp'al	Pretest	9.56	1.688	18
		No pretest	6.78	2.110	23
		Total	8.00	2.366	41
	Control	Pretest	7.80	2.872	25
		No pretest	8.89	2.242	27
		Total	8.37	2.597	52
	Total	Pretest	8.53	2.576	43
		No pretest	7.92	2.406	50
		Total	8.20	2.492	93
RTIME 2	Exp'al	Pretest	12.67	1.910	18
		No pretest	10.39	3.230	23
		Total	11.39	2.932	41
	Control	Pretest	11.08	2.499	25
		No pretest	12.19	2.842	27
		Total	11.65	2.714	52
	Total	Pretest	11.74	2.381	43
		No pretest	11.36	3.128	50
		Total	11.54	2.800	93

Table 9 shows a higher MFFT accuracy mean score for the pretested experimental group compared with the no-pretested experimental group. It may be inferred that pre-testing influenced the results. The pretested control group had a lower MFFT accuracy mean score than the no-pretested control group.

Pretesting did not gain an advantage for the control group. The results for response time indicates that for the experimental groups, the means for the pre-test group (12.67) and the non-pre-test group (10.39) were significantly different (Mean diff = 2.28, $p = .009$), but the means for the control groups did not differ significantly between the pre-test (11.08) and no-pre-test (12.19) groups (Mean diff = 1.105, $p = .145$). Thus, the pre-test effect was only evident in the experimental groups, with the pre-test group having a higher response time than the no pre-test group.

The Box's test of equality of covariance indicated that the covariances were equal across the groups in the test. The MANOVA multivariate results showed that there was no significant main effect for treatment [Wilk's $\lambda = .999$, $F(2, 88) = .065$, $p = .937$, $\eta 2p = .001$] and pre-test [Wilk's $\lambda = .967$, $F(2, 88) = .1.493$, $p = .230$, $\eta 2p = .033$]. There was however, a significant main interaction effect of treatment and pre-test [Wilk's $\lambda = .843$, $F(2, 88) = .8.186$, $p = .001$, $\eta 2p = .157$].

The univariate between subjects' tests were examined to see which of the independent variables had the significant interaction effect. The results showed that there was significant interaction effects for both MFFT accuracy rate – [$F(1, 89) = 84.703$, $p < .001$, $\eta 2p = .151$] and response time – [F(1, 89 = 64.906, $p = .004$, $\eta 2$ p= .091]. This indicated that the pre-test had significant effect on the post-test scores. The simple effects test was therefore performed for the pre-tested groups and no pre-tested groups to get the exact nature of the interaction effects for the MFFT accuracy rate and response time in table 10.

Table 10-*Pairwise Comparisons of Treatment and Prettest/Posttest MFFT 2 Accuracy Mean Scores*

Pretest or No Pretest	(I) Exp'tal or Control	(J) Exp'tal or Control	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Pretest	Exp'tal	Control	1.756*	.714	.016	.337	3.175
	Control	Exp'tal	-1.756*	.714	.016	-3.175	-.337
No Pretest	Exp'tal	Control	-2.106*	.656	.002	-3.409	-.804
	Control	Exp'tal	2.106*	.656	.002	.804	3.409

*Dependent Variable: MFFT 2 SCORE: *.*
The mean difference is significant at the .05 level. b. Adjustment for multiple comparisons: Sidak.

The simple effects analysis in Table 10 indicated that there was a significant difference between the experimental and control group scores on accuracy rate for both pre-test (Mean diff = 1.76, p = .016) and no pre-test (Mean diff = 2.11, p = .002). For the pre-tested groups, the mean accuracy score for the experimental group was higher than the control group, while the reverse was the case for the no pre-test groups. Thus, MFFT accuracy scores for the pre-tested groups had improved, while scores for the no pre-test groups had significantly reduced.

Table 11 presents the comparison of mean differences between experimental and control groups with regard to pre-test or no pre-test.

Table 11-*Pairwise Comparison for MFFT 2 Accuracy*

Exp'tal or Control	(I) Pretest or no pretest	(J) Pretest or no pretest	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Exp'tal	Pretest	No pretest	2.773*	.727	.000	1.328	4.218
	No pretest	Pretest	-2.773*	.727	.000	-4.218	-1.328
Control	Pretest	No pretest	-1.089	.641	.093	-2.363	.185
	No pretest	Pretest	1.089	.641	.093	-.185	2.363

Based on estimated marginal means
**. The mean difference is significant at the .05 level.*
b. Adjustment for multiple comparisons: Sidak.

The results indicated a significant difference between the pre-test group and the no pre-test group means on the MFFT accuracy for the experimental groups (Mean diff = 2.77, $p < .001$), but there was no significant difference for the control groups (Mean diff = 1.09, $p = .093$).

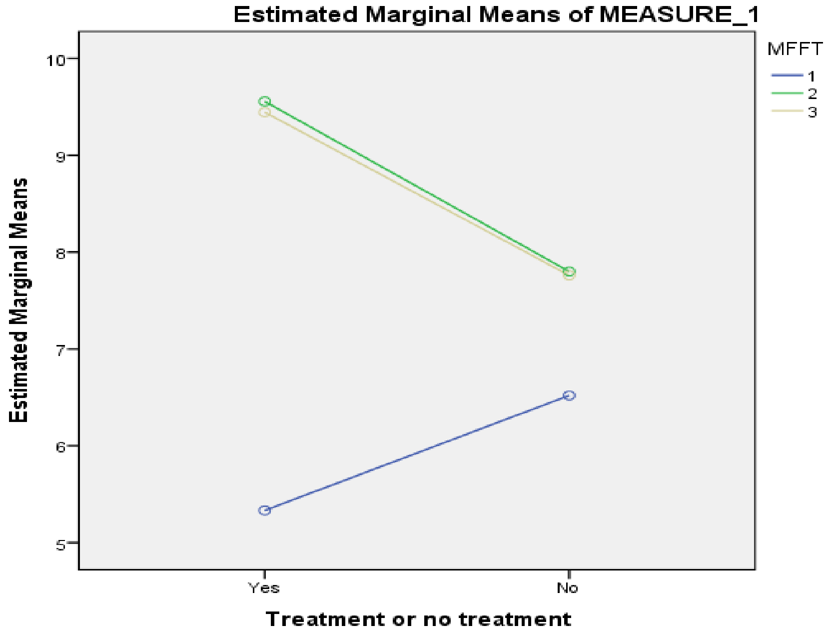
The within group ANOVA test was conducted to test whether there were significant changes between the three measures (pre-test, post-test and delayed post). The Mauchly's Test of Sphericity indicated that the variance of the difference between each pair of repeated measures of MFFT accuracy was approximately equal [W(2) = .928, $p = .223$]. The results of the within group ANOVA showed that both MFFT accuracy [$F(2, 82) = 23.56$, $p < .001$, $\eta 2p$ = .365] and interaction effect [F (2, 82) = 6.759, p- . 002, $\eta 2p$ = .142] were significant. Pairwise comparison results (Table 13) showed that the pre-test accuracy score was significantly lower than both post-test (Mean diff = 2.75, $p < .001$) and delayed post (Mean diff = 2.68, $p < .001$). There was, however, no significant difference between the post-test and delayed post (Mean diff = .076, p = .998) as presented in Table 12 and depicted in Figure 4.

Table 12-*Pairwise Comparison of Pre, Post and Delayed Post MFFT Accuracy*

(I) MFFT	(J) MFFT	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Pretest	Post test	-2.751*	.403	.000	-3.753	-1.749
	Delayed	-2.676*	.509	.000	-3.942	-1.409
Post test	Pretest	2.751*	.403	.000	1.749	3.753
	Delayed	.076	.452	.998	-1.050	1.201
Delayed	Pretest	2.676*	.509	.000	1.409	3.942
	Post test	-.076	.452	.998	-1.201	1.050

Further, within-group ANOVA analysis results showed MFFT accuracy differences between the pre-test and the post-test (Mean diff = 4.22, p < .001), and delayed post (Mean diff = 4.11, p < .001), but no difference between the post-test and the delayed post-test response times, indicating that for the experimental group that received pre-test, there was priming for the post-test. There was however no significant difference between any of the pairs of means in the control group. This implies that the cognitive modelling strategy has been effective in improving problem solving strategy of the subjects.

Figure 4 presents a pictorial view of mean scores of pre, post and delayed post MFFT accuracy scores for the experimental and control groups.



MFFT 1= Pretest, MFFT = Post test, MFFT 3 = Delayed Post test

Figure 4: *Means Plot for MFFT Accuracy*

The illustration in Figure 4 suggests that the difference between the pre-test and the post-test accuracy score was sustained to the delayed post-test. Though the between-subjects effects showed no significant overall treatment effect, the significant interaction effect suggests that the within-group effect differs between the experimental and control groups. The pairwise comparisons indicated that there was no significant difference in the pre-test scores between the experimental and control groups (Mean diff = 1.19, p = .145). This suggests that the two experimental conditions had equivalent baseline. For the post-test, however, there was a significant difference between the experimental and control groups (Mean diff = 1.76, p = .026), with the mean accuracy rate for the experimental group being higher than that of the control. This effect was sustained to the delayed post.

The within-group ANOVA analysis was again used to test whether the mean scores of the response time for pre-test, post-test and delayed post-test were significantly different. The Mauchly's Test of Sphericity was first measured for response time. And it showed there was equality of variance within the three measures [W = .964, p = .477]. The statistics for the sphericity assumed was therefore reported for the between subjects' effects. The within-subjects effect for response time is presented in Table 13.

Table 13-*Within-Subjects' Effects-Pre, Post, Delayed Post for RTime*

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	η2 p
RTIME	Sphericity Assumed	922.139	2	461.070	74.056	.000	.644
	Greenhouse-Geisser	922.139	1.930	477.836	74.056	.000	.644
	Huynh-Feldt	922.139	2.000	461.070	74.056	.000	.644
	Lower-bound	922.139	1.000	922.139	74.056	.000	.644
RTIME * Treatment	Sphericity Assumed	37.488	2	18.744	3.011	.055	.068
	Greenhouse-Geisser	37.488	1.930	19.426	3.011	.057	.068
	Huynh-Feldt	37.488	2.000	18.744	3.011	.055	.068
	Lower-bound	37.488	1.000	37.488	3.011	.090	.068
Error (RTIME)	Sphericity Assumed	510.527	82	6.226			
	Greenhouse-Geisser	510.527	79.123	6.452			
	Huynh-Feldt	510.527	82.000	6.226			
	Lower-bound	510.527	41.000	12.452			

The results from Table 13 show significant differences exist in response time within the experimental and control groups [$F(2, 82) = 74.06$, $p < .001$, η2 p=.644]. There was however, no interaction effect of treatment and response time measures [F(2, 82) = 3.01, p = .056, η2 p= .068].

The post hoc analysis then was done, following significant within subject effect to find out which of the measure significantly differ. Comparison between the three measures of Response Time is presented in Table 14.

Table 14-*Pairwise Comparison of 3 of Rtime*

(I) RTIME	(J) RTIME	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Pretest	Posttest	-3.609*	.491	.000	-4.830	-2.387
	Delayed Posttest	-6.629*	.569	.000	-8.045	-5.213
Posttest	Pretest	3.609*	.491	.000	2.387	4.830
	Delayed Posttest	-3.020*	.573	.000	-4.446	-1.594
Delayed Posttest	Pretest	6.629*	.569	.000	5.213	8.045
	Posttes	3.020*	.573	.000	1.594	4.446

The results show that the post-test response time was significantly lower than that of the pretest (mean diff = 3.61, p < .001), and the delayed posttest response time was further lower than the pretest (mean diff = 6.63, p < .001)). Again, the response time for the delayed post was significantly lower than that of the post test (mean diff = 3.02, p < .001). Given that there was no significant interaction effect of treatment and time measures, this means the results indicated here were similar for both experimental and control groups. All the three measures of pre- post- and delayed post for response time were significant. The results further indicated that the baseline measure (pre-test) response time for the experimental and control groups were not significantly different (Mean diff = .751, p = .323). There was however, a significant difference between the experimental and control groups at the post-test (Mean diff = 1.59, p = .029), but no significant difference was observed with regard to the delayed post-test (Mean diff = 1.54, p = .100). The means plot of RTime for experimental and control groups is presented in Figure 5.

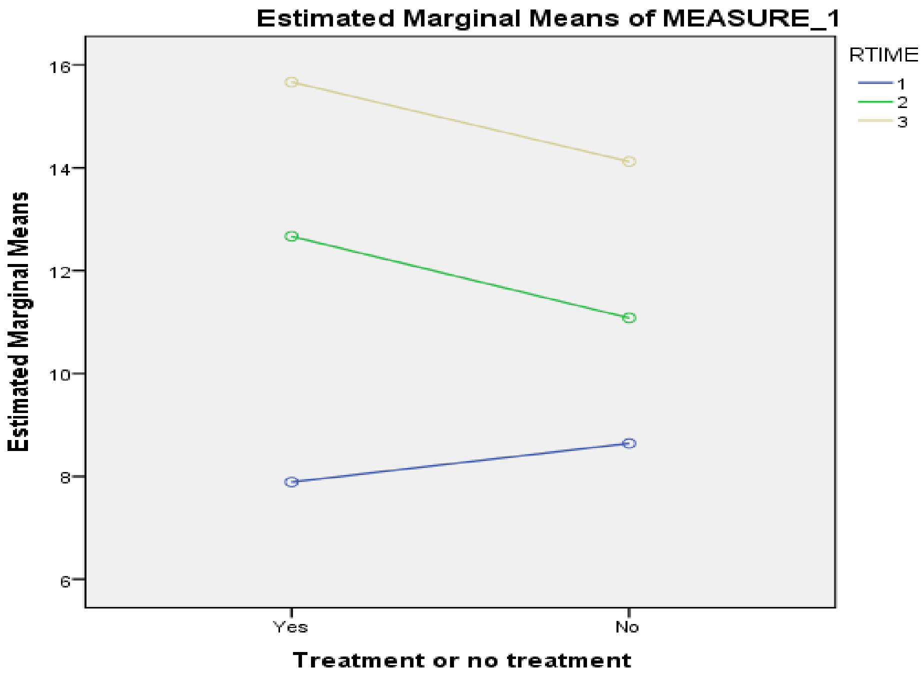


Figure 5: *Means Plot on RTimes for Experimental and Control Groups*

The experimental treatment had been effective in increasing the response time of the pupils in the study at the post-test. There was also an increase in the difference between the post-test and the delayed post-test. The implication here is that the cognitive modelling strategy has been effective in improving problem solving ability of the pupils. The null hypothesis is therefore rejected.

The results obtained here are consistent with some other studies that used modelling in modifying the impulsive characteristics of their research subjects (eg., Herman, 1982; Olasehinde, 1992; Nwamuo, 2010; Nkrumah 2013). For example, Schunk (1981) provided children deficient in division skills with either cognitive modelling of division operations or didactic instruction, along with practice opportunities, over a number of sessions. During cognitive modelling, the children observed an adult model verbalize operations while solving problems. Children who received training in cognitive modelling solved more division problems correctly on the post-test, although both treatments enhanced self-efficacy on division operations equally well. Nwamuo (2010) also modified the disruptive behaviours of some primary school children using cognitive modelling. Results of her study showed that modelling was effective in reducing impulsive behaviour characteristics of her subjects after intervention. Nkrumah (2013) also used modelling to train impulsive children to delay responses and improve their accuracy scores on the MFFT. Results showed improved accuracy scores and delayed response in the experimental group relative to the control group.

In the original modelling experiment conducted by Bandura (1981), the research subjects were children. It therefore seems to suggest that the technique is more effective when employed with children, as wildly reiterated by Odoemelam (1994). However, some other studies have modified young adults (and teenagers) disruptive behaviours using modelling. Olasehinde (1992) trained some impulsive senior secondary school students on how to approach cognitive task reflectively. The results of her studies showed that there was an increased performance of the experimental group as against the control group at post-test measures. Gorrell (1993) also improved the classroom management skills of some undergraduate students using cognitive modelling. Such studies add to the literature to suggest that the modelling technique is effective for both adult and children populations.

Another trait of the modelling technique worth mentioning, although not tested as a separate hypothesis is the fact that the efficacy of the therapy does not lie with adult models only. Some studies (eg., Herman, 1982) have shown that peer modelling is also effective. For example, Herman (1982) employed a peer modelling strategy to modify the impulsive cognitive style of his research subjects. In a similar fashion, Schunk and Hanson (1985) had peers teach cognitive modelling strategy to increase self-efficacy of some school children. Results of his study showed that modelling was effective at enhancing the self-efficacy and problem-solving abilities of his research subjects. Odoemelam (1994) used peer modelling to reduce behaviour problems and increase self-concept of her pupils. The treatment was effective for children with minor, mild and moderate behaviour problems.

The technique has also been employed to treat subjects with diverse personality problems and dimensions of psychological traits. In the present study and some others (Schunck, 1981; Olasehinde, 1992, Nwamuo, 2010; Nkrumah, 2013) the technique was used to assist impulsive subjects to approach cognitive problem-solving task reflectively and they reported positive results. Some other researchers employed modelling to increase the self-efficacy (Odoelemam, 1994) and the self-concept (Gorrell, 1993) of their research subjects and they also reported that the technique was effective. In effect, the modelling technique seems to be efficient not only with cognitive problem-solving abilities, but also other areas of psychological traits as indicated above.

Certain ecological differences such as cultural orientation (for example socialization on aptness), and values could create variations on some psychological therapies. In the Ghanaian context, for example, people who provide quick responses attract all sort of names even when they are correct most of the time. In New Zealand however, prompt responses to questions are highly emphasised (Nkrumah & Neumann, 2017). Such cultural traits for example, can impact on training strategies that border on time. However, the modelling technique seems to be effective irrespective of the ecology. It has been shown to achieve positive results in studies conducted in the Western countries (Schunk & Hanson, 1985), Oceania (Herman, 1982) and currently in Africa (Odoelemam, 1994; Nwamuo. 2010; Nkrumah, 2013).

Finally, it must be noted that although the current study reported a positive impact of modelling on children's problem-solving abilities (as measured by response time and accuracy rate), the results showed a significant increase in response time as compared to increase in accuracy on the MFFT. Put another way, the children delayed their responses better than getting much accuracy. This finding is similar to some studies (Yando & Kagan, 1968; Debus, 1970) which demonstrated that their subjects increased their response time but not necessarily their accuracy scores. In the current study as well, there was a significant increase in the response time but not the accuracy rate on the MFFT. The reason why this happens is not actually known. However, this researcher speculates that the processes involved in modelling requires subjects to control impulse and delay on the task. The delay is assumed to help the subject reflect over issues and improve accuracy. However, it is possible that sometimes subjects may deliberately delay responses without conscious efforts to avoid errors.

Hypothesis Two

There is no significant effect of self-talk on the problem-solving abilities of impulsive children.

Descriptive statistics of MFFT 2 and response time for experimental and pre-test factors are presented in Table 15.

Table 15-*Descriptive Statistics for MFFT 2 and RTime 2 for Experimental and Pre-test Factors*

	Exp'tal/or Control	Pretest or no pretest	Mean	Std. Deviation	N
MFFT 2 SCORE	Exp'tal	Pretest	10.94	2.048	31
		No pretest	10.00	2.024	22
		Total	10.55	2.071	53
	Control	Pretest	6.50	2.282	18
		No pretest	4.87	1.975	38
		Total	5.39	2.197	56
	Total	Pretest	9.31	3.022	49
		No pretest	6.75	3.182	60
		Total	7.90	3.350	109
R TIME 2	Exp'tal	Pretest	13.71	1.970	31
		No pretest	16.55	2.345	22
		Total	14.89	2.539	53
	Control	Pretest	7.67	2.114	18
		No pretest	7.53	2.719	38
		Total	7.57	2.522	56
	Total	Pretest	11.49	3.560	49
		No pretest	10.83	5.080	60
		Total	11.13	4.454	109

The means showed differences between both the experimental and control groups for both MFFT accuracy and Response time measures, with the experimental groups recording higher means than the control groups. MFFT accuracy for pretested groups (both experimental and control) had higher means than the no pretested groups. However, for response time experimental groups, the pretested group had a lower mean than the no pretested group.

The two-way MANOVA was used to test the effect that self-talk intervention had on the problem-solving abilities of the impulsive subjects. The Box's test of equality of covariance showed that the covariances were equal (M = 13.58, p = .160) across the groups. The Wilks lambda was therefore observed for the results of the multivariate analysis in Table 16.

Table 16-*Multivariate Tests of Self-Talk*

Effect		Value	F	Hypo. df	Error df	Sig.	η2 p
Treatment	Pillai's Trace	.719	132.893[b]	2.000	104.00	.000	.719
	Wilks' Lambda	**.281**	**132.893[b]**	**2.000**	**104.00**	**.000**	**.719**
	Hotelling's Trace	2.556	132.893[b]	2.000	104.00	.000	.719
	Roy's Largest Root	2.556	132.893[b]	2.000	104.00	.000	.719
Pretest	Pillai's Trace	.275	19.703[b]	2.000	104.00	.000	.275
	Wilks' Lambda	**.725**	**19.703[b]**	**2.000**	**104.00**	**.000**	**.275**
	Hotelling's Trace	.379	19.703[b]	2.000	104.00	.000	.275
	Roy's Largest Root	.379	19.703[b]	2.000	104.00	.000	.275
Treatment * Pretest	Pillai's Trace	.096	5.528[b]	2.000	104.00	.005	.096
	Wilks' Lambda	**.904**	**5.528[b]**	**2.000**	**104.00**	**.005**	**.096**
	Hotelling's Trace	.106	5.528[b]	2.000	104.00	.005	.096
	Roy's Largest Root	.106	5.528[b]	2.000	104.00	.005	.096

a.Design: Intercept + Treatment + Pretest + Treatment * Pretest
b.Exact statistic

The results from Table 16 showed that the treatment [Wilk's λ = .281, F (2, 104) = 133, p = .001, η2 p= .719], pre-test [Wilk's λ = .725, F(2, 104) = 19.70, p = .001, η2 p= .275] and interaction [Wilk's λ = .904, F(2, 104) = 5.53, p = .001, η2 p= .157], were all significant. Levene's Test of Equality for MFFT 2 accuracy conducted indicated equality of variance for both MFFT accuracy scores and response time. Subsequently, the test of between-subjects' effects is presented in Table 17.

Table 17-*Test of Between-Subjects Effects*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Treatment	MFFT 2 SCORE	573.546	1	573.546	135.418	.000	.563
	R TIME 2	1421.624	1	1421.624	256.781	.000	.710
Pretest	MFFT 2 SCORE	41.294	1	41.294	9.750	.002	.085
	R TIME 2	5.527	1	45.527	8.223	.005	.073
Treatment * Pretest	**MFFT 2 SCORE**	**3.036**	**1**	**3.036**	**.717**	**.399**	**.007**
	R TIME 2	55.503	1	55.503	10.025	.002	.087
Error	MFFT 2 SCORE	444.713	105	4.235			
	R TIME 2	581.315	105	5.536			

a. R Squared = .633 (Adjusted R Squared = .623)

Results for between-subjects effects showed significant treatment and pre-test effects for both MFFT accuracy and response time in Table 20. The interaction effect was however significant for only response time, but not for MFFT accuracy score [F (1, 105) = .717, p = 007]. This led to further analysis for both response time and MFFT accuracy to find out whether the pre-test had had effect on the post-test scores, and whether the experimental treatment had been significant. The main effect test for experimental and control groups was performed for the MFFT accuracy scores in Table 18.

Table 18-*Pairwise Comparisons MFFT 2 Accuracy*

(I) Exp'tal/or Control	(J) Exp'tal/or Control	(I-J) Mean Difference)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
					Lower Bound	Upper Bound
Exp'tal	Control	4.061*	.642	.000	2.767	5.354
Control	Exp'tal	-4.061*	.642	.000	-5.354	-2.767

**. The mean difference is significant at the .05 level.*

b. Adjustment for multiple comparisons: Bonferroni.

The comparison for the MFFT accuracy, showed a significant difference between the experimental and the control groups (Mean diff = 4.06, $p < .001$) in favour of the experimental group.

Mauchly's test of sphericity showed there was no equality of variance within the groups [W(2) = .673, $p < .001$]. The Greenhouse-Geisser statistics were therefore interpreted as shown in Table 19.

Table 19-*Test of Within-Subjects Effects for MFFT Accuracy*

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
SELFTALK_ MFFT	Sphericity Assumed	171.197	2	85.599	32.427	.000	.408
	Greenhouse-Geisser	171.197	1.507	113.617	32.427	.000	.408
	Huynh-Feldt	171.197	1.579	108.422	32.427	.000	.408
	Lower-bound	171.197	1.000	171.197	32.427	.000	.408
SELFTALK_ MFFT * Treatment	Sphericity Assumed	90.381	2	45.190	17.119	.000	.267
	Greenhouse-Geisser	90.381	1.507	59.982	17.119	.000	.267
	Huynh-Feldt	90.381	1.579	57.240	17.119	.000	.267
	Lower-bound	90.381	1.000	90.381	17.119	.000	.267

The results of the within-subjects test of self-talk in Table 19 showed significant effects for both MFFT accuracy [$F(1.51, 70.82) = 32.43$, $p < .001$, $\eta 2p = .408$ and interaction of the MFFT accuracy measures and treatment conditions [$F(1.58, 70.82) = 17.12$, $p < .001$, $\eta 2p = .267$]. This means that the self-talk intervention had had a positive effect on the MFFT accuracy scores for the pupils.

Simple effects test for MFFT 2 is showed in Table 20.

Table 20-*Simple Effects Pairwise Comparison on 3 Measures of MFFT Accuracy*

Exp'tal or Control	(I) SELFTALK _MFFT	(J) SELFTALK _MFFT	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Exp'tal	Pretest	Posttest	-3.903*	.470	.000	-5.067	-2.740
		Delayed Posttest	-4.258*	.466	.000	-5.412	-3.104
	Posttest	Pretest	3.903*	.470	.000	2.740	5.067
		Delayed Posttest	-.355	.270	.479	-1.023	.314
	Delayed Posttest	Pretest	4.258*	.466	.000	3.104	5.412
		Posttest	.355	.270	.479	-.314	1.023
Control	Pretest	Posttest	-.778	.617	.514	-2.305	.749
		Delayed Posttest	-.556	.612	.748	-2.070	.958
	Posttest	Pretest	.778	.617	.514	-.749	2.305
		Delayed Posttest	.222	.354	.899	-.655	1.099
	Delayed Posttest	Pretest	.556	.612	.748	-.958	2.070
		Posttest	-.222	.354	.899	-1.099	.655

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Sidak.

Examination of the simple effects in Table 20 indicated that the results were different for the experimental and the control groups. For the experimental groups, there were significant differences between the pretest and posttest MFFT accuracy scores (mean diff = 3.90, $p < .001$), and between pretest and delayed posttest (mean diff = 4.26, $p < .001$). There was however, no significant difference between the posttest and the delayed post (mean diff = .355, $p = .479$), and no significant difference between any of the pairs of measures in the control groups. Furthermore, examination of the simple effects indicated that the results were different for the experimental and the control groups. For the experimental groups, there were significant difference between the pretest and posttest MFFT accuracy (mean diff = 3.90, $p < .001$), and between pretest and delayed posttest (mean diff = 4.26, $p < .001$). There was, however, no significant difference between the posttest and the delayed post (mean diff = .355, $p = .479$). There was no significant difference between any of the pairs of measure in the control groups. This is further evidence that the self-talk intervention had been effective in improving cognitive performance of the pupils in the study.

Mean plot for self-talk MFFT accuracy for pretest, post-test and delayed post-test is illustrated in Figure 6.

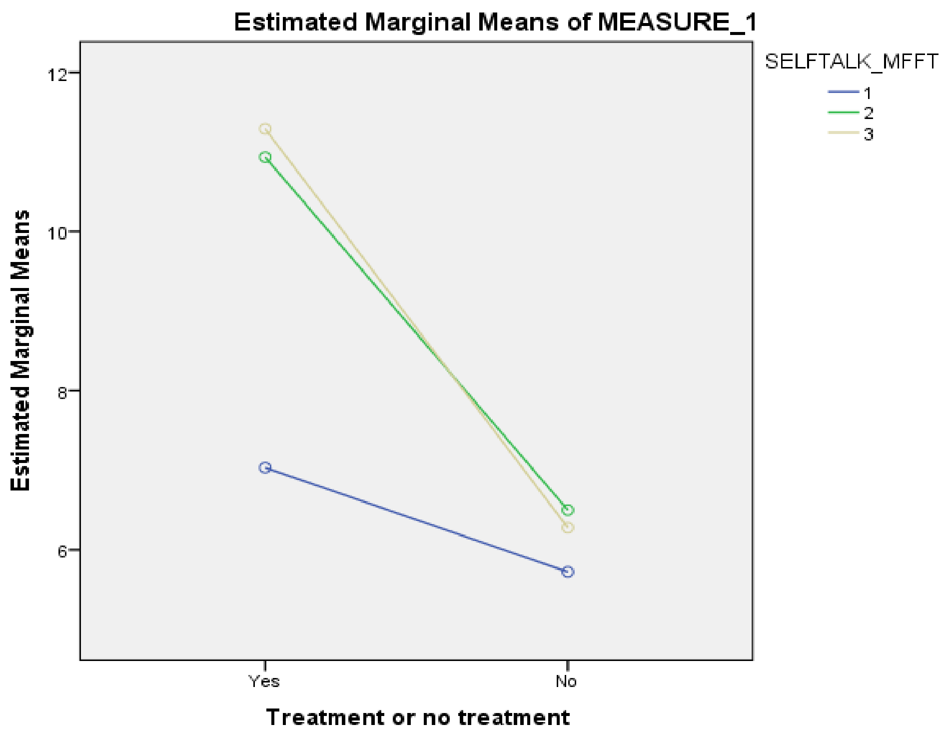


Figure 6: *Mean Plot for Self-talk MFFT*

The MFFT accuracy scores for both post-test and delayed post were significantly higher for the experimental than the control groups as the Means Plot in Figure 6 illustrates.

Following the significant interaction effect, the simple effects analysis for the response time was performed as shown in Table 21.

Table 21-Simple Effects Pairwise Comparisons of RTime 2

Exp'tal/ or Control	(I) Pre-test or no pre-test	(J) Pre-test or no pre-test	Mean Diff. (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff Lower Bound	Upper Bound
Exp'tal	Pretest	No pretest	-2.836*	.656	.000	-4.136	-1.535
	No pretest	Pretest	2.836*	.656	.000	1.535	4.136
Control	Pretest	No pretest	.140	.673	.835	-1.195	1.475
	No pretest	Pretest	-.140	.673	.835	-1.475	1.195

Based on estimated marginal means
**. The mean difference is significant at the .05 level.*
b. Adjustment for multiple comparisons: Sidak.

Descriptive statistics for response time for treatment and pre-test/post-tests scores showed that for the experimental group, there was significant difference between the pre-test (Mean = 13.71) and no pre-test (Mean = 16.55) groups, with the no pre-test group having a higher response time than the pre-test group (Mean diff =2.84, $p < .001$). From Table 23, there was no significant difference between pre-test and no pre-test groups for the control groups (Mean diff = 0.14, $p > .05$). There were also significant differences between experimental and control groups for both pre-test (Mean diff = 6.04, $p < .001$) and no pre-test groups (Mean diff = 9.02, $p < .001$). The experimental groups for both pre-test and no pre-test groups were significantly higher on response time than the control groups. This showed that the self-talk treatment was significant even for the un pre-tested experimental group. Thus, for the experimental groups, the pre-test had a negative effect on the response time.

The within group ANOVA test was conducted to test whether there were significant changes between the three measures (pre-test, post-test and delayed post) for response time. The within group comparison for response time shows significant differences between experimental and control groups, as illustrated in Table 22.

Table 22-*Experimental/Control Measures for RTime*

Experimental/ Control	RTIME	Mean	Std. Error	95% Confidence Interval for Diff Lower Bound	Upper Bound
Exp'tal	Pretest	14.774	.466	13.838	15.711
	Posttest	13.710	.363	12.979	14.441
	Delayed Post	12.419	.444	11.527	13.312
Control	Pretest	6.444	.611	5.215	7.674
	Posttest	7.667	.477	6.707	8.626
	Delayed Post	7.778	.582	6.607	8.949

For the experimental groups, the pre-test had a higher response time (M = 14.77, SE = .47), reducing at the post test (M = 13.71, SE = .36), and even still lower at the delayed post-test (M = 12.42, SE = .44), as indicated in Table 24. The control groups had the reverse, with the pre-test having the lowest response time (M = 6.44, SE = .61), increasing for the post test (M = 7.67, SE = .48), and even still further at the delayed post-test (M = 7.78, SE = .58). Equality of variance was not assumed by the Mauchly's Test of Sphericity. It indicated no variance between each pair of repeated measures of response time [W (2) = .875, p = .047]. The Greenhouse-Geisser was therefore interpreted in Table 23.

Table 23-*Tests of Within-Subjects Effects for RTime*

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
RTIME	Sphericity Assumed	9.334	2	4.667	1.066	.348	.022
	Greenhouse-Geisser	9.334	1.778	5.249	1.066	.342	.022
	Huynh-Feldt	9.334	1.883	4.958	1.066	.345	.022
	Lower-bound	9.334	1.000	9.334	1.066	.307	.022
RTIME * Treatment	Sphericity Assumed	78.939	2	39.470	9.018	.000	.161
	Greenhouse-Geisser	78.939	1.778	44.390	9.018	.000	.161
	Huynh-Feldt	78.939	1.883	41.929	9.018	.000	.161
	Lower-bound	78.939	1.000	78.939	9.018	.004	.161

Table 23 indicates that the within-subject effects was not significant [F(1.78, 83.58) = 1.07, p = .342, η2 p= .022], but there was a significant interaction effect [F(1.78, 83.58) = 9.02, p < .001, η2 p= .161]. The Levene's test of equality of error variance indicated equality for post-test and delayed post-test, but not for pre-test. Thus, equality of variance was partially met. The between subjects' effects showed significant treatment effect on the response time. Thus, there was significant difference between the experimental and control groups [F(1, 47) = 168.20, p < .001, η2 p= .782]. The three measures of response time were compared in Table 24.

Table 24-*Pairwise Comparison on 3 Measures of RTime*

Exp'tal/ Control	(I) RTIME	(J) RTIME	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Exp'tal	Pretest	Posttest	1.065	.576	.071	-.094	2.223
		Delayed Post	2.355*	.577	**.000**	1.194	3.516
	Posttest	Pretest	-1.065	.576	.071	-2.223	.094
		Delayed Post	1.290*	.427	**.004**	.430	2.150
	Delayed Post	Pretest	-2.355*	.577	**.000**	-3.516	-1.194
		Posttest	-1.290*	.427	**.004**	-2.150	-.430
Control	Pretest	Posttest	-1.222	.756	.112	-2.742	.298
		Delayed Post	-1.333	.757	.085	-2.857	.190
	Posttest	Pretest	1.222	.756	.112	-.298	2.742
		Delayed Post	-.111	.561	.844	-1.240	1.017
	Delayed Post	Pretest	1.333	.757	.085	-.190	2.857
		Posttest	.111	.561	.844	-1.017	1.240

The response time for the pre-tested experimental group was longer than for the control group (Mean diff = 6.34, $p < .001$). Pairwise comparisons indicated that the baseline measure (pre-test) was not significant between the experimental and control groups. Figure 7 illustrates the means plot for the measures of response time.

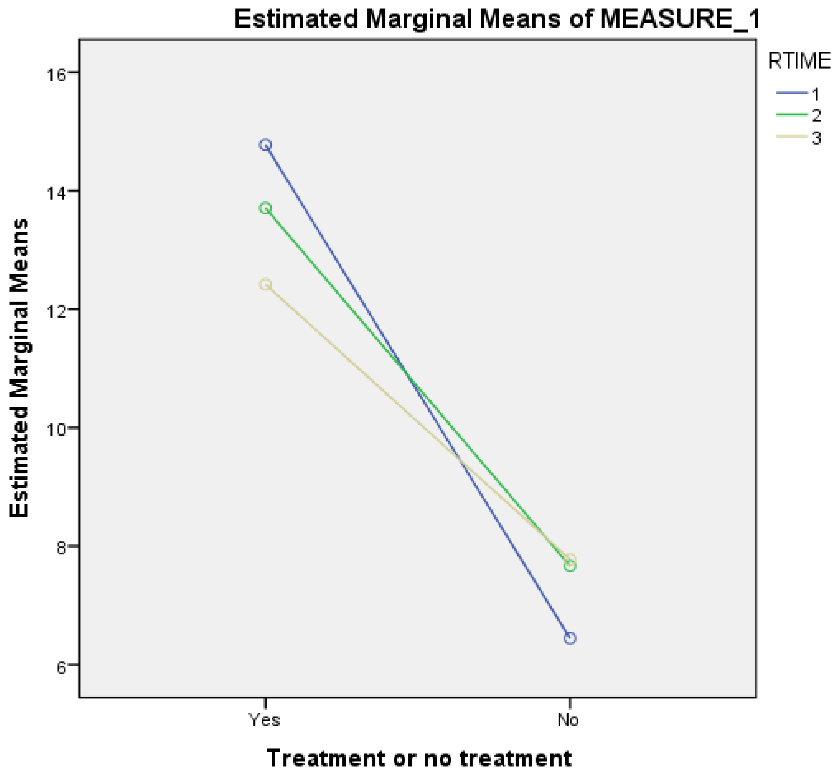


Figure 7: Means Plot for 3 Measures of Self-talk RTime

Examination of the pre-test and post-test response time differences indicated that there was no significant difference (Mean diff = 1.07, p = .071), but there was significant difference between the pre-test and the delayed post-test (Mean diff= 2.36, p < .001), as well as between post-test and delayed post-test (Mean diff = 1.28, p =.004) as is pictorially presented in the means plot in Figure 7.

Overall, there was evidence that the self-talk intervention had improved the MFFT accuracy scores as well as the response time of the experimental group. Put another way, self-talk was effective at modifying the problem-solving abilities of impulsive children. The null hypothesis is therefore rejected. The results obtained in this hypothesis regarding the effectiveness of self-talk is similar with some other available findings. Meichenbaum and Goodman (1971) for example examined the efficacy of self-instructional training procedure in altering the behaviour of impulsive school children. Their results showed significant improvement (on the Porteus Maze Test, performance IQ, on the WISC and on a measure of cognitive impulsivity) in the Self-Instruction group relative to the attentional and assessment control groups. In a related study, Gargallo (1993) included training in self-talk in the manner of Meichenbaum (1981) in which overt verbalization was faded into inaudible internal speech by previously low achieving impulsive school children. Results showed that the intervention yielded positive reflective results on the MFFT-20 and other performance tests by the experimental group as against the control group.

An intriguing aspect of the self-talk strategy is that its potency has been tested with different grades of subjects and all those achieved positive results (Winsler & Naglieri, 2003; Corkum et al., 2008). In a study that involved cognitively impulsive learning-disabled boys, the subjects were made to watch a video of a boy modelling self-talk to solve MFFT items. Subjects were made to repeat the model's self-directed self-talk. The results showed that the experimental group significantly reduced their error rate on the MFFT items, compared to the control groups (Cullinan, Epstein, & Silver, 1977). Riviera-Flores (2015) achieved similar results with the MFFT after training children with ADHD to use self-talk to modify their impulsive behaviour. In addition, Ashori and Jalil-Abkenar (2015) also reported its effectiveness with intellectually challenged ninth grade students.

It has been hypothesised that there is a link between children's use of self-talk strategies that are self-regulatory in nature and their classroom Mathematical achievement (Lee & McDonough, 2015). The results of such studies however showed a lack of statistically significant correlation between the Self-Talk Questionnaire (STQ) that was filled by the children and their Mathematical achievement scores. Lee and McDonough (2015) argued that it is possible that among other explanations, self-talk may have less of an impact on problem solving when it is largely internalised. It is also possible that the role of self-talk in children's problem-solving abilities are task-specific and cannot be assumed to have a positive impact on general classroom achievement and learning. A trajectory of studies has however shown that self-talk is capable of modifying the problem-solving abilities of children as shown in the present study.

The literature available on self-talk so far seem to have been conducted mainly with children and teenagers in school situations. Although, a study by Alarcon-Rubio, Sanchez-Medina, and Winsler (2013) reported the success of self-talk with illiterate adults. In their study, a sample of 126 illiterate adults who were enrolled in a public literacy programme were trained with self-talk to perform a ‘‘school-like’’ task as a function of literacy. Whenever these illiterate adults engaged in the most difficult tasks, externalized self-talk was more frequently observed, just as in children. Even with this success story of self-talk, it may be insufficient to assume that the self-talk strategy is equally effective for adults, because it has not been widely explored with adult populations. Further studies could probably employ self-talk in managing impulsivity among adults for a clearer understanding of its efficacy with such populations.

The effectiveness of the self-talk strategy observed here and those found with other studies also suggest that the efficacy of the strategy is not largely influenced by ecological characteristics. All the studies reviewed here were conducted in the Western world and they showed positive results. The present study was conducted in Africa, Ghana to be specific, where children are likely to show more different ecological characteristics relative to the Western child, yet, the strategy was effective.

It is worth noting that although the self-talk procedure has been shown effective in the Ghanaian context and with children in this study, the practices in Ghanaian classrooms may stifle the use of such strategies by children. In the Ghanaian classrooms, children are mostly engaged in silent independent work (silent reading and also in Mathematics). Sometimes, children receive punishment for talking even in low tones when doing class exercises and other classroom tasks. In short, silent and independent work is highly emphasized. Therefore, if children are supposed to self-talk (as a reflectivity strategy) through cognitive tasks, then there requires a structural modification to our current school practices. For example, a teacher who teaches children to self-talk when performing cognitive tasks may have to do more training and conscientize children that it is okay to talk out loud while performing tasks.

Hypothesis Three

There is no significant effect of a combination of cognitive modelling and self-talk in modifying the problem-solving abilities of impulsive children.

Descriptive statistics of MFFT accuracy and response time for the experimental condition and pre-test status for this hypothesis indicated that both experimental groups and control groups showed higher MFFT accuracy scores as well as response times for the pre-test than the no pre-test groups. The two-way MANOVA in Table 25 was used to find out whether the differences observed in the means for MFFT accuracy scores and response time were significantly different. The Box's test showed that the covariance of MFFT accuracy score and response time (dependent variables) were equal across the groups of independent variables.

Table 25-*Multivariate Test for Cognitive Modelling + Self-talk*

Effect		Value	F	Hypo df	Error df	Sig.	η2 p
Intercept	Pillai's Trace	.911	348.637[b]	2.000	68.000	.000	.911
	Wilks' Lambda	.089	348.637[b]	2.000	68.000	.000	.911
	Hotelling's Trace	10.254	348.637[b]	2.000	68.000	.000	.911
	Roy's Largest Root	10.254	348.637[b]	2.000	68.000	.000	.911
Treatment	Pillai's Trace	.201	8.538[b]	2.000	68.000	.000	.201
	Wilks' Lambda	**.799**	**8.538[b]**	**2.000**	**68.000**	**.000**	**.201**
	Hotelling's Trace	.251	8.538[b]	2.000	68.000	.000	.201
	Roy's Largest Root	.251	8.538[b]	2.000	68.000	.000	.201
Pretest	Pillai's Trace	.105	3.993[b]	2.000	68.000	.023	.105
	Wilks' Lambda	**.895**	**3.993[b]**	**2.000**	**68.000**	**.023**	**.105**
	Hotelling's Trace	.117	3.993[b]	2.000	68.000	.023	.105
	Roy's Largest Root	.117	3.993[b]	2.000	68.000	.023	.105
Treatment * Pretest	Pillai's Trace	.074	2.726[b]	2.000	68.000	.073	.074
	Wilks' Lambda	**.926**	**2.726[b]**	**2.000**	**68.000**	**.073**	**.074**
	Hotelling's Trace	.080	2.726[b]	2.000	68.000	.073	.074
	Roy's Largest Root	.080	2.726[b]	2.000	68.000	.073	.074

a. Design: Intercept + Treatment + Pretest + Treatment * Pretest

b. Exact statistic

The Wilk's λ of the multivariate MANOVA test was therefore interpreted. The resultfrom Table 27 showed significant effects for treatment and pre-test. There was, however, no interaction effect. Results of tests of between-subjects' effects for both MFFT 2 accuracy and Response time 2 is presented in Table 26.

Table 26-*Tests of Between-subjects Effects for MFFT 2 and RTime 2*

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	η2 p
Treatment	MFFT 2 SCORE	96.842	1	96.842	17.265	.000	.200
	R TIME 2	118.528	1	118.528	6.875	.011	.091
Pretest	MFFT 2 SCORE	41.355	1	41.355	7.373	.008	.097
	R TIME 2	104.643	1	104.643	6.070	.016	.081
Treatment * Pretest	MFFT 2 SCORE	12.229	1	12.229	2.180	.144	.031
	R TIME 2	2.157	1	2.157	.125	.725	.002
Error	MFFT 2 SCORE	387.032	69	5.609			
	R TIME 2	1189.519	69	17.239			
Total	MFFT 2 SCORE	4416.000	73				
	R TIME 2	13047.000	73				

a. R Squared = .319 (Adjusted R Squared = .289)

b. R Squared = .167 (Adjusted R Squared = .130)

The between-subjects effects analysis indicated significant treatment effects for both MFFT accuracy scores [(F (1, 69) = 17.27, p < .001] and response time [F (1, 69) = 6.88, p = .011]. Pre-testing effects were also observed for both MFFT accuracy [F (1, 69) = 7.37, p = .008] and response time [F(1, 69) = 6.07, p = .016]. The means plot for the two variables for the combined strategy are presented in Figures 8 and 9.

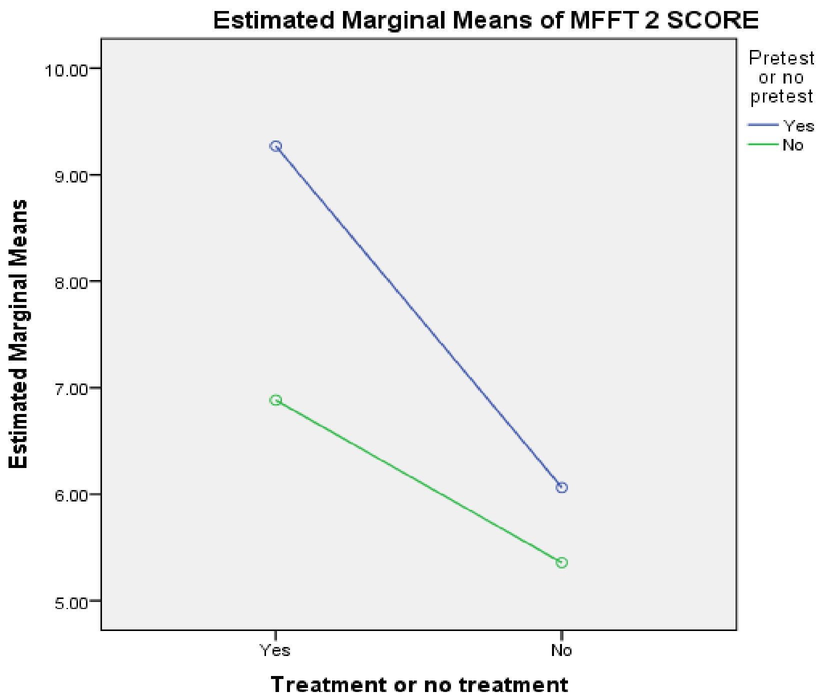


Figure 8: Means Plot of Interaction Effects for MFFT 2 Accuracy for Combined Strategy.

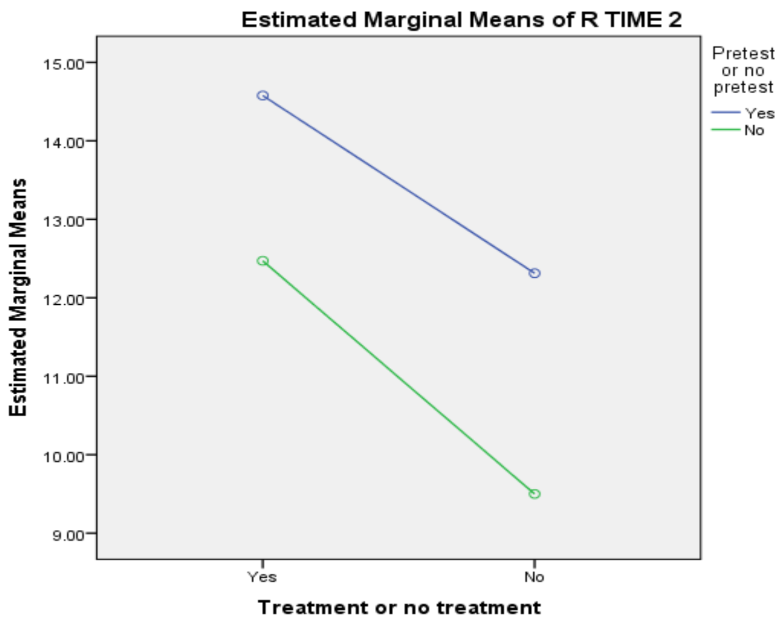


Figure 9: Means Plot of Interaction Effect of RTime 2 for Combined Strategy.

The interaction effects for both MFFT accuracy scores and response time were, not significant as depicted in Figures 8 and 9. There was however significant treatment effect observed so the main effects analysis between experimental and control groups was performed.

Pairwise Comparisons for MFFT accuracy and Response Time for the combined strategy are presented in Table 27.

Table 27-*Pairwise Comparisons for MFFT Accuracy and RTime*

Dependent Variable	(I) Exp'tal/ or Control	(J) Exp'tal/ or Control	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
MFFT 2	Exp'tal	Control	2.592*	.598	.000	1.399	3.785
	Control	Exp'tal	-2.592*	.598	.000	-3.785	-1.399
R TIME 2	Exp'tal	Control	2.744*	1.016	.009	.719	4.769
	Control	Exp'tal	-2.744*	1.016	.009	-4.769	-.719

Based on estimated marginal means
**. The mean difference is significant at the .05 level.*
b. Adjustment for multiple comparisons: Bonferroni.

The results in Table 27 depict a significant main effect of treatment on problem-solving for both MFFT 2 accuracy score (Mean diff= 2.59, $p < .001$) and RTime 2 (Mean diff = 2.74, $p = .009$). Greenhouse -Geisser was therefore interpreted. These tests of within-subjects' effects is presented in Table 28.

Table 28-*Tests of Within-subjects Effects for Combined Treatment for MFFT Accuracy*

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	η2 p
MFFT_Cmbd	Sphericity Assumed	63.279	2	31.639	4.985	.009	.111
	Greenhouse-Geisser	63.279	1.470	43.060	4.985	.018	.111
	Huynh-Feldt	63.279	1.550	40.825	4.985	.016	.111
	Lower-bound	63.279	1.000	63.279	4.985	.031	.111
MFFT_Cmbd * Treatment	Sphericity Assumed	85.628	2	42.814	6.746	.002	.144
	Greenhouse-Geisser	85.628	1.470	58.268	6.746	.005	.144
	Huynh-Feldt	85.628	1.550	55.244	6.746	.005	.144
	Lower-bound	85.628	1.000	85.628	6.746	.013	.144
Error(MFFT_Cmbd)	Sphericity Assumed	507.705	80	6.346			
	Greenhouse-Geisser	507.705	58.783	8.637			
	Huynh-Feldt	507.705	62.000	8.189			
	Lower-bound	507.705	40.000	12.693			

Within subjects effects showed there was significant difference within the groups [$F(1.47, 58.78) = 4.99$, $p = .018$, η2p = .111]; as well as interaction between the measures and treatment conditions [$F(1.47, 58.78) = 6.75$, $p = .005$, η2 p = .144]. Comparison of within-subjects' effects of MFFT accuracy between the three measures of the combined strategy showed that the post-test MFFT accuracy scores were significantly higher than the pre-test scores (Mean diff = 1.78, $p = .031$), but the delayed post-test was not significantly different from the pre-test (Mean diff =.793, $p = .512$). The delayed post MFFT accuracy scores showed a significant drop from the post-test (Mean diff = .990, $p = .027$).

Table 29 presents a test of between subjects' effects for MFFT accuracy on the combined strategy.

Table 29-*Tests of Between-Subjects Effects for MFFT Accuracy on the Combined Strategy*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Intercept	1800.432	1	1800.432	466.101	.000	.921
Treatment	31.172	1	31.172	8.070	.007	.168
Error	154.510	40	3.863			

The test of between-subjects effect showed a significant overall treatment effect, $F(1, 40) = 8.07$, $p = .007$, $\eta 2p = .168$. Pairwise comparison between the experimental and control groups showed that the MFFT accuracy scores for the experimental group was significantly higher than that of the control group (Mean diff = 1.77, $p = .007$). Given that the interaction effect was significant, the simple effect analysis was conducted to compare the three measures in the experimental and control groups, as presented in Table 30.

Table 30-*Comparison Between the 3 Measures in the Experimental and Control Groups*

MFFT_ Cmbd	(I) Exp'tal or Control	(J) Exp'tal or Control	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Pretest	Exp'tal	Control	-.611	1.177	.607	-2.989	1.768
	Control	Exp'tal	.611	1.177	.607	-1.768	2.989
Posttest	Exp'tal	Control	3.207*	.816	.000	1.557	4.857
	Control	Exp'tal	-3.207*	.816	.000	-4.857	-1.557
Delayed Post	Exp'tal	Control	2.726*	.632	.000	1.448	4.004
	Control	Exp'tal	-2.726*	.632	.000	-4.004	-1.448

The results from Table 30 showed that the baseline measure (pre-test) MFFT accuracy for the experimental and control groups were not significantly different (Mean diff =.611, $p = .607$). There was, however, significant difference between the experimental and control groups at the post-test (Mean diff =3.21, $p < .001$), and also at the delayed post (Mean diff = 2.73, $p < .001$). Furthermore, the simple effects analyses showed significant differences between the three measures. These were only evident in the experimental groups. For instance, none of the three measures significantly differed within the control group, but there were significant differences between the measures within the experimental groups.

The simple effects analysis is presented in Table 31.

Table 31-*Simple Effects Test of MFFT Accuracy Comparison Between the 3 Measures for Combined Strategy*

Exp'tal or control	(I) MFFT_ Cmbd	(J) MFFT_ Cmbd	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Exp'tal	Pretest	Posttest	-3.692*	.818	.000	-5.730	-1.655
		Delayed Post	-2.462*	.773	.008	-4.389	-.534
	Posttest	Pretest	3.692*	.818	.000	1.655	5.730
		Delayed Post	1.231*	.445	.025	.123	2.339
	Delayed Post	Pretest	2.462*	.773	.008	.534	4.389
		Posttest	-1.231*	.445	.025	-2.339	-.123
Control	Pretest	Posttest	.125	1.042	.999	-2.472	2.722
		Delayed Post	.875	.986	.762	-1.582	3.332
	Posttest	Pretest	-.125	1.042	.999	-2.722	2.472
		Delayed Post	.750	.567	.475	-.662	2.162
	Delayed Post	Pretest	-.875	.986	.762	-3.332	1.582
		Posttest	-.750	.567	.475	-2.162	.662

In Table 31, both post-test (Mean diff = 3.69, $p < .001$) and delayed post-test (Mean diff = 2.46, $p = .008$) were significantly higher than the pre-test MFFT accuracy scores within the experimental group. There was also significant difference between the post-test and the delayed post- test, but the MFFT accuracy scores at the delayed post had dropped significantly (Mean diff =1.23, $p = .025$). The results therefore indicate that a combination of cognitive modelling and self-talk had effect on problem solving. Thus, the combined strategy improved cognitive performance, but the effect was not sustained (it actually dropped) after intervention was withdrawn. The hypothesis is therefore rejected.

For response time, descriptive statistics indicated that the means for the experimental group improved significantly between the pre-test (M=8.7, SD = 2.9) and the post-test (M=14.6, SD = 4.9), though there was a drop in the delayed post-test (M= 12.4,SD= 2.4) This indicated that the pre-test may have primed the experimental group to slow down their responses considerably in the post-test, and that was slightly dropped in the delayed post-test. For the control group, there were some gains made from the pre-test (M=10.9, SD=4.6) to the post-test (M=12.3, SD=4.7), which was sustained in the delayed post-test (M=12.1, SD= 3.4).

Simple effects test for response time was performed indicated in Table 32.

Table 32-*Comparison Between the 3 Measures of Rtime in the Experimental and Control Groups*

Exp'tal or control	RTIME_ Cmbd	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
	Pretest	8.654	.709	7.221	10.087
Exp'tal	Posttest	14.577	.941	12.674	16.480
	Delayed	12.385	.557	11.258	13.511
	Pretest	10.938	.904	9.111	12.764
Control	Posttest	12.313	1.200	9.887	14.738
	Delayed	12.063	.711	10.626	13.499

The test in Table 32 indicated there was significant mean difference between pre- and post tests, experimental and control groups. Sphericity assumption was violated [W(2) = .804, p = .014]. Greenhouse-Geisser statistics was therefore reported. The within-subjects analysis showed in Table 33.

Table 33-*Tests of Within-Subjects Effects for RTime*

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
RTIME_ Cmbd	Sphericity Assumed	273.389	2	136.694	10.981	.000	.215
	Greenhouse-Geisser	273.389	1.673	163.432	10.981	.000	.215
	Huynh-Feldt	273.389	1.781	153.510	10.981	.000	.215
	Lower-bound	273.389	1.000	273.389	10.981	.002	.215
RTIME_ Cmbd * Treatment	Sphericity Assumed	103.167	2	51.583	4.144	.019	.094
	Greenhouse-Geisser	103.167	1.673	61.673	4.144	.026	.094
	Huynh-Feldt	103.167	1.781	57.929	4.144	.024	.094
	Lower-bound	103.167	1.000	103.167	4.144	.048	.094
Error (RTIME_ Cmbd)	Sphericity Assumed	995.833	80	12.448			
	Greenhouse-Geisser	995.833	66.912	14.883			
	Huynh-Feldt	995.833	71.237	13.979			
	Lower-bound	995.833	40.000	24.896			

Table 33 indicated that within-subjects effects showed for response time, there were significant differences within the groups F(2, 67 = 10.98, p < = .001, η2 p = .215; as well as interaction between the measures and treatment conditions F(2,67) = 4.14, p = .026, η2 p = .094. The simple effects pairwise comparison was performed for treatment on all three measures shown Table 34.

Table 34-*Pairwise Comparison of Combined Strategy for RTime*

Exp'tal or control	(I) RTIME_ Cmbd	(J) RTIME_ Cmbd	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
Exp'tal	Pretest	Posttest	-5.92*	1.18	.000	-8.85	-2.10
		Delayed	-3.73*	.88	.000	-5.91	-1.55
	Posttest	Pretest	5.92*	1.18	.000	2.10	8.85
		Delayed	2.19*	.85	.041	.07	4.32
	Delayed	Pretest	3.73*	.88	.000	1.55	5.91
		Posttest	-2.19*	.852	.041	-4.32	-.07
Control	Pretest	Posttest	-1.38	1.50	.743	-5.11	2.36
		Delayed	-1.13	1.12	.685	-3.91	1.66
	Posttest	Pretest	1.38	1.50	.743	-2.36	5.11
		Delayed	.25	1.09	.994	-2.46	2.96
	Delayed	Pretest	1.13	1.12	.685	-1.66	3.91
		Posttest	-.25	1.09	.994	-2.96	2.46

Comparison in Table 34 indicates that for all the three measures experimental treatment were significant whereas none of the control measures were significant. Between pre-test and post-test (Mean diff = 5.92, $p < .001$), response time for the experimental group improved significantly, but there was a drop at the delayed post-test (Mean diff = 2.19, $p = .041$). The pre-test primed the experimental group to slow down their responses considerably in the post-test, and that was slightly dropped in the delayed post-test Put another way, the results obtained here indicated that a combination of cognitive modelling and self-talk had effect on problem solving. The combined strategy improved cognitive performance, but the effect was not sustained (it dropped) after intervention was withdrawn.

A unique contribution of this study was the researcher's ability to test the cognitive modelling and self-talk strategies independently and then test the combined effect of the two, in the same study. In most cases, researchers test for either cognitive modelling or self-talk. There have however been cases where a combination of strategies has effectively yielded positive results. For instance, Olasehinde (1986) improved some impulsive secondary school students' approach to cognitive task using three reflective training strategies - modelling with self-instructions (MSI), Self-Instructions alone (SI) and Programmed Instruction (PI) – to increase students' academic performance. The present hypothesis was modelled after Meichenbaum and Goodman (1971) where the researchers combined the relative strengths of cognitive modelling and self-talk to reduce impulsive behaviour of their subjects and improve their performance on the MFFT. In that study, whereas cognitive modelling slowed down the response time, it was the addition of self-talk training that resulted in a reduction of errors on the task. Cameron and Robinson (1980) also employed both self-instructional and self-management skills to train 7-8-year-old hyperactive children on a cognitive training program. The researchers reported evidence suggesting generalization to untrained behaviours as shown by an increase in self-correction of oral reading by all subjects.

In hypothesis one, the results showed that although impulsivity (as measured by response time and accuracy scores) had reduced based on subjects' scores on the MFFT, the improvement was more of the subject's response time at the expense of their accuracy scores. It therefore appears that modelling alone is of limited value in altering the tendency of impulsive children to make many errors. Some researchers (Heider, 1971; Zelniker, et al, 1972; Egeland, 1974) are of the view that cognitive modelling procedure with reflective thinking practices, without any separate strategy does not help pupil's accurate responding in problem solving. Therefore, it is not adequate to train pupils only to delay responses to task without conscious instruction in reflective thinking practices. Pupils would only wait in an attempt to compensate teacher's instruction of waiting, without any decrease in errors. However, modelling combined with oral descriptions of processing strategies (as done here) has been found effective in reducing the number of errors and increasing accuracy.

This researcher speculates that the improved accuracy and response time observed in the combined strategy were contributions of both strategies (modelling plus self-talk). It is possible that self-talk provided the accuracy whereas cognitive modelling contributed the delay. This speculation is based on observations from hypotheses one and two. Hypothesis one that involved only modelling, measured more response time than accuracy scores, whereas hypothesis two involving self-talk provided more accuracy scores than response time.

Hypothesis Four and Five

There is no significant difference between the effectiveness of cognitive modelling and self-talk training in modifying the problem-solving abilities of impulsive children.

There is no significant difference between the effects of a single reflective teaching strategy (cognitive modelling and/or self-talk) and a combined teaching strategy (cognitive modelling plus self-talk) on the problem-solving abilities of impulsive children.

Both hypotheses four and five sought to compare the effectiveness of the three interventions: Cognitive modelling against Self-talk, and then those two against the combined Cognitive modelling and Self talk. The one-way MANOVA was used for the analysis. The gain scores (difference between pre-test and post test scores) of both MFFT accuracy and response time were used as the dependent variables, as this clearly brings out the gains that were made as a result of the interventions between the pre-test period and the post-test. In this regard, only the pre-tested groups of the Solomon 4 design were utilised. Descriptive statistics showed that MFFT accuracy was highest for self-talk (Mean = 2.76, SD = 3.0); followed by cognitive modelling (M=2.51, SD = 2.96), and lastly a Mean of 2.24 with SD of 4.53 for the combined intervention. But for response time, means was far less for self-talk (Mean = -.22, SD = 3.36) than for cognitive modelling (Mean = 3.42., SD = 3.34), and for the combined strategy (Mean =4.19, SD = 6.32). The response time indicated that self-talk was the lowest, with the combined strategy having the highest response time. The MANOVA results was computed for the three interventions. The Box's test indicated that the covariances were not equal (Box's M = 33.37. $p < .001$) across the interventions, so the multivariate tests was performed, presented in Table 35.

Table 35-*Multivariate Tests of Effects of Cognitive Strategies*

Effect		Value	F	Hypo df	Error df	Sig.	η2 p
Method	Pillai's Trace	.254	9.535	4.000	262.000	.000	.127
	Wilks' Lambda	.746	10.258[b]	4.000	260.000	.000	.136
	Hotelling's Trace	.340	10.977	4.000	258.000	.000	.145
	Roy's Largest Root	.340	22.266[c]	2.000	131.000	.000	.254

The results in Table 35 showed a significant multivariate effect on all three strategies. An interpretation of the Pillai's trace as shown in the table suggests that the effectiveness of the interventions significantly differed on at least one of the dependent variables [F (4, 262) = 9.54, P<.001, η2p = .127]. The between subjects' effects were therefore examined to find out which of the dependent variables showed significant differences between the interventions, shown in Table 36.

Table 36-*Tests of Between Subjects Effects for MFFT Accuracy and RTime*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Method	MFFT_Diff	6.046	2	3.023	.241	.786	.004
	RTIME_Diff	516.080	2	258.040	12.739	.000	.163
Error	MFFT_Diff	1641.424	131	12.530			
	RTIME_Diff	2653.472	131	20.256			
Total	MFFT_Diff	2495.000	134				
	RTIME_Diff	3896.000	134				

a. *R Squared = .004 (Adjusted R Squared = -.012)*

b. *R Squared = .163 (Adjusted R Squared = .150)*

The results of the between-subjects' effects in Table 36 showed a significant effect for response time [F (2, 131) = 12.74, p < .001, η2p = .163]. There was however, no significant effect for MFFT accuracy [F (2, 131) = 0.241, p = .786, η2p = .004]. The Levene's test showed variance for the response time was not equal across the groups. The Games-Howell test of multiple comparisons (post hoc) was used to ascertain which of the interventions was significantly different and which strategy was most effective. This is presented in Table 37.

Table 37-*Games-Howell Test of Multiple Comparisons (post hoc)*

Dependent Variable	(I) Teaching technique	(J) Teaching technique	Mean Diff (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
MFFT_Diff	Cognitive modelling	Self-talk	-.2435	.623	.919	-1.7288	1.2419
		Cognitive modelling + self-talk	.2735	.832	.942	-1.7178	2.2649
	Self-talk	Cognitive modelling	.2435	.623	.919	-1.2419	1.7288
		Cognitive modelling + self-talk	.5170	.820	.804	-1.4459	2.4799
	Cognitive modelling + self-talk	Cognitive modelling	-.2735	.832	.942	-2.2649	1.7178
		Self-talk	-.5170	.820	.804	-2.4799	1.4459
RTIME_Diff	Cognitive modelling	Self-talk	3.6431*	.701	.000	1.9725	5.3137
		Cognitive modelling + self-talk	-.7719	1.101	.764	-3.4167	1.8730
	Self-talk	Cognitive modelling	-3.6431*	.701	.000	-5.3137	1.9725
		Cognitive modelling + self-talk	-4.4150*	1.088	.000	-7.0289	1.8010
	Cognitive modelling + self-talk	Cognitive modelling	.7719	1.101	.764	-1.8730	3.4167
		Self-talk	4.4150*	1.088	.000	1.8010	7.0289

The results in Table 37 show that the response time for self-talk was significantly lower than the other two strategies. The mean difference between cognitive modelling and the combined method was not significant (Mean diff = .77, $p > .001$), but that between self-talk and the combined method was significant (Mean diff = 4.42, $p < .001$). Also, the mean difference between self-talk and cognitive modelling was significant (Mean diff = 3.64, $p < .001$). The between-subject effects in Table 36 were again examined to find out which of the dependent variables showed significant differences between the interventions. The results showed a significant effect for response time [F (2, 131) = 12.74, $p < .001$, $\eta 2p = .163$]. There was however, no significant effect for MFFT accuracy [F (2, 131) = 0.241, $p = .786$].

The post hoc results indicated in Table 37, showed that the response time for self-talk was significantly less than the other two strategies. The mean difference between self-talk and cognitive modelling was significant, just as that between self-talk and the combined method was significant. Cognitive modelling did not differ significantly from the combined intervention. The change in time spent on the problem-solving task between the pre-test and the post-test was lowest for self-talk as compared to cognitive modelling and the combined strategy. Subjects exposed to the self-talk strategy spent significantly, a shorter time in responding to test stimuli than those exposed to cognitive modelling. Hypothesis four overall showed no significant difference between the effectiveness of cognitive modelling and self-talk. Null hypothesis four was therefore accepted. Apart from decreased response time for self-talk, there was no significant difference between the effectiveness on problem solving ability using a single strategy or using a combined one. Null hypothesis five was therefore also accepted. The results showed that, in terms of the MFFT accuracy scores, no intervention was significantly superior or more effective than the other in getting the correct responses. The null hypothesis for hypothesis five is therefore accepted.

Simply described, the results obtained from hypothesis four as already stated showed that there was no significant difference between the use of either cognitive modelling or self-talk in modifying the problem solving abilities of impulsive children. In other words, no strategy was superior to the other in improving the problem solving abilities of the subjects. Quite intriguing, a deeper look at the results suggests that, although neither strategy was superior over the other, in terms of the MFFT (measures of response time and accuracy scores), the subjects who underwent the cognitive modelling training strategy appeared to have produced more delayed responses after intervention, than those who were given training in self-talk.

In an attempt to explain the response time difference between the two cognitive strategies in hypothesis four, the researcher conjectures that, the cognitive modelling processes followed in this study involved steady attention, thinking and processing of information from the verbalizations and activities of the model. According to Meichenbaum’s (1971) study, the verbalizations which appear in cognitive modelling include ones which focus on questions that compensate on possible comprehension deficits, cognitive rehearsal and planning in order to overcome any possible production deficiency, verbalization for self-guidance during the task to overcome possible mediation deficiency, and as well, for self-reinforcement. The child uses his own verbalizations to control his nonverbal behaviour. He is provided with an opportunity to produce a narrative description of his behaviour before and during his performance. Cognitive modelling might involve more challenging cognitive processing in terms of the procedure, including finding appropriate vocabulary to use that they comprehend and can easily verbalise. All these processes may add to the longer response time produced in the cognitive modelling group. In self-talk only however, the subject is explicitly trained to produce the self-instructions the model emitted while performing the task, therefore they may require less time to process verbalisations in performing activities.

According to the inhibition-based account of selective attention, successful selective attention is the result of an interplay between target activation and target inhibition. By this account, the initial exposure to a stimulus activates internal categorical representations for targets and distractors concurrently (Neumann & DeSchepper, 1991). Hence, for successful goal-directed behaviour to happen, an excitatory mechanism acts to enhance target information whereas an inhibitory mechanism concurrently suppresses the activation levels of the distractor information. In this case, the subject's goal-directed behaviour was to solve the MFFT questions without thinking out loud. However, there is excitation of words ready to be vocalised, but the subject has to make efforts to suppress verbalisations. The excitation and inhibition that comes to play in cognitive modelling could have caused the increased response time observed in the cognitive modelling group. In self-talk however, what is excited (verbalisations by the instructor) are verbalised and there is no further effort to inhibit verbalisation. This would make subjects in the self-talk group respond faster than those in the cognitive modelling or the combined group as observed here.

With hypothesis five, even though various researchers have used both single and mixed strategies, few have sought to compare the effectiveness of one over the other. Most studies have been more interested only in whether any particular or group of strategies could modify impulsivity. In this study, the finding that there is no significant difference between the use of the combined strategy and the single strategy is inconsistent with what is in literature. Literature reveals that most of those who used combined strategies achieved more success than a single strategy. For instance, Meichenbaum’s (1971) study revealed that adding self-talk training to cognitive modelling procedures significantly altered the attentional strategies of the impulsive children and facilitated behavioural change, leading to higher latency and accuracy rates on the MFFT. Also in Ammer’s (1983) study, even though all three strategies used resulted in a significant difference in response time, difference in errors for the single strategies of cognitive modelling and self-talk were not significant but was significant for the combined strategy.

Perhaps, learning an additional strategy in this study was helpful but not significant to conclude that subjects who received training in either one of the two strategies were at a disadvantage. Even practising the two strategies could have been more difficult for subjects in the combined group, and that could account for the inability of the additional benefits perceived to accrue from the combined strategy to accentuate. A clearer explanation could be pointed out in hypothesis eight where the groups were given intervention and tested in Mathematics and English Language. The conjecture still holds for the comparison between the use of a single and the combined strategy in comparing the effectiveness of a single against a combined strategy. Cognitive modelling is a part of the combined method, so it may still carry its feature of excitation/ inhibition of verbalisation, thereby delaying response time.

Hypothesis Six

There is no significant effect of cognitive modelling on impulsive pupils' performance in Mathematics and English.

From descriptive statistics on English and Mathematics tests, the results for the English test showed that the pre-test scores for both experimental and control groups were lower than the no pre-tested groups. In terms of performance the groups that were not pre-tested scored better than those who were not. The same trend was observed in the Mathematics scores as well.

The two-way MANOVA test was conducted to find out whether the observed differences were significant. The Box's test of equality of covariance indicated that the covariances were not equal across groups. The Pillai's Trace statistics were therefore reported in Table 38.

Table 38-*Multivariate Tests Effect of Cognitive Modelling on Performance.*

Effect		Value	F	Hypothesis df	Error df	Sig.	η2 p
Exp'tal	Pillai's Trace	.250	14.633[b]	2.000	88.000	.000	.250
	Wilks' Lambda	.750	14.633[b]	2.000	88.000	.000	.250
	Hotelling's Trace	.333	14.633[b]	2.000	88.000	.000	.250
	Roy's Largest Root	.333	14.633[b]	2.000	88.000	.000	.250
Pre-test	Pillai's Trace	.297	18.627[b]	2.000	88.000	.000	.297
	Wilks' Lambda	.703	18.627[b]	2.000	88.000	.000	.297
	Hotelling's Trace	.423	18.627[b]	2.000	88.000	.000	.297
	Roy's Largest Root	.423	18.627[b]	2.000	88.000	.000	.297
Exp'tal * Pretest	Pillai's Trace	.113	5.616[b]	2.000	88.000	.005	.113
	Wilks' Lambda	.887	5.616[b]	2.000	88.000	.005	.113
	Hotelling's Trace	.128	5.616[b]	2.000	88.000	.005	.113
	Roy's Largest Root	.128	5.616[b]	2.000	88.000	.005	.113

The multivariate test in Table 38 showed significant effects for the experimental [F(2, 88) = 14.63, p < .001, η2p = .250], pre-test condition [F(2, 88) = 18.63, p < .001, η2p = .297] as well as the interaction effect [F(2, 88) = 5.62, p = .005, η2p = .113]. The between subjects' effects for the dependent variables (English and Mathematics) were analysed. The Levene's test in showed variance for the subjects was not equal. Tests for between-subjects' effects for English and Mathematics performance is displayed in Table 39.

Table 39-*Test of Between-Subjects' Effects*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Treatment	ENG 2 SCORE	548.011	1	548.011	1.865	.176	.021
	MATH 2 SCORE	5792.334	1	5792.334	26.291	.000	.228
Pre-test	ENG 2 SCORE	928.475	1	928.475	3.159	.079	.034
	MATH 2 SCORE	7153.929	1	7153.929	32.471	.000	.267
Experiment * Pre-test	ENG 2 SCORE	186.651	1	186.651	.635	.428	.007
	MATH 2 SCORE	2246.204	1	2246.204	10.195	.002	.103
Error	ENG 2 SCORE	26157.166	89	293.901			
	MATH 2 SCORE	19608.271	89	220.318			
Total	ENG 2 SCORE	385325.000	93				
	MATH2 SCORE	333819.000	93				

The results of the between-subjects effects in Table 50 showed significant effect for experimental condition [$F(2, 88) = 14.63$, $p < .001$, η2p = .250], pre-test condition [$F(2, 88) = 18.63$, $p < .001$, η2p = .297] and interaction on only Mathematics. There was no effect on English test score. The post hoc analysis was therefore done for Mathematics performance in Table 40.

Table 40-*Pairwise Comparisons Between Experimental and Control Groups*

Dep Variable	(I) Exp'tal or Control	(J) Exp'tal or Control	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
ENG 2	Exp'tal	Control	4.911	3.597	.176	-2.235	12.058
SCORE	Control	Exp'tal	-4.911	3.597	.176	-12.058	2.235
MATH 2	Exp'tal	Control	15.968*	3.114	.000	9.780	22.155
SCORE	Control	Exp'tal	-15.968*	3.114	.000	-22.155	-9.780

The pairwise comparison for Mathematics in Table 40 showed significant difference between the experimental group and control group (Mean diff = 15, $p < .001$).

Comparison between pre-test and no pre-test groups also showed significant difference between the two groups (Mean diff = 17.75, $p < .001$). The results therefore demonstrated that the treatment had an effect on both pre-test and no pre-test groups. However, the no pre-test group performed significantly higher than the pre-test group. It is obvious in terms of problem-solving abilities that the groups were not equal, and the pre-test had no priming effect. The null hypothesis is therefore accepted.

Studies on behaviour modification that tested the impact of the training strategies on students' performance have usually used English and Mathematics. Perhaps, English and Mathematics are usually chosen for investigation because they appear to be the basic and core areas of study universally. In the present study, the researcher tested the efficacy of the modelling therapy on pupils' performance in Mathematics and English. The study found out that modelling had a positive impact on Mathematics but not in

English. Schunk (1981) and Schunk and Hanson (1985) for example provided children deficient in division skills with either cognitive modelling of division operations (using adult models) and children deficient in subtraction skills with peer cognitive modelling. Children who received cognitive modelling both with adult and peer models, solved more division and subtraction problems correctly on the post-test, and also demonstrated enhanced self-efficacy in Mathematics problem solving. Herman (1982) also used cognitive (peer) modelling to improve Mathematics, reading and spelling performance of some impulsive subjects.

None of the studies reviewed so far attempted to find out whether impulsive behaviour modification has impact on the problem-solving abilities of impulsive children in Mathematics better than in English or vice versa. Although no hypothesis was tested to this effect, it was observed that there was improvement in Mathematics better than in English. Superficially, it is assumed that reflective processes are more engaging in Mathematics than in English. In Mathematics, for example, problems of addition that require carry overs (usually done in primary four) demand a lot of impulse control (even when the child knows the correct approach) so that the child does not miss out on the "remainders". Also, in Mathematics, there are sometimes more than one way of approaching a problem, in such cases, the child has to think through the easiest approach. Some of these engagements make Mathematics seem more reflective oriented than English. At the level of the participants employed here, English involves more of comprehension exercises and tense construction. In this case, impulse control is important, but may not be critical especially in situations where the child knows the right approach. It will be prudent for further studies to compare the potency of cognitive modelling between Mathematics and English for clearer understanding of this issue.

Hypothesis Seven

There is no significant effect of self-talk training on impulsive pupils' performance in Mathematics and English.

The results for descriptive statistics for this hypothesis indicated are for pre-tested and no pretested groups as well as for experimental and control groups. The results on the English test for the experimental groups seem to be equal for pre-test (Mean = 64.68, SD. 15.37) and no pre-test groups (Mean = 65.91, SD.= 14.37). For the control group however, there seem to be noticeable difference between the pre-test group (Mean = 55.00, SD = 15.48) and no pre-test group (Mean = 46.97, SD = 25.27). The grand mean for the experimental group (65.19) was higher than that of the control group (49.55). The overall mean for pre-test groups (61.12) was also higher than the no pre-test group (53.92). The overall mean score on the English test by all the 109 respondents was 57.16.

The results for the Mathematics test indicated pre-test sensitisation effect on the subjects. The results for both experimental and control groups show higher scores for the pre-test groups than for the no pre-test groups. The mean for the experimental group with pre-test (Mean = 64.81, SD = 10.60) was noticeably higher than the no pre-test group (Mean = 57.05, SD = 13.16). The mean score for the control group with pre-test (Mean = 46.39, SD = 12.93) was also clearly higher than that of the no pre-test (Mean = 28.68, SD = 12.34). The overall mean for the pre-test groups (58.04) was higher than the mean for no pre-test groups (39.08), with that of the pre-test being higher than the grand mean of 47.61.

The two-way MANOVA was used to test whether the observed means were significantly different from each other. There were two independent factors (pre-test or no pre-test and experimental or control), and two dependent measures (English and Mathematics scores).

The Box's M test indicated that the covariances were not equal across the dependent variables [Box's M = 19.65, p ,0.26]. The Pillai's Trace statistics were therefore used for the interpretation of the multivariate MANOVA test results, presented in Table 41.

Table 41-*Multivariate Tests of Effect of Self-Talk on Performance*

Effect		Value	F	Hypothesis df	Error df	Sig.	η 2 p
Exp'tal	Pillai's Trace	.470	46.096[b]	2.000	104.000	.000	.470
	Wilks' Lambda	.530	46.096[b]	2.000	104.000	.000	.470
	Hotelling's Trace	.886	46.096[b]	2.000	104.000	.000	.470
	Roy's Largest Root	.886	46.096[b]	2.000	104.000	.000	.470
Pre-test	Pillai's Trace	.221	14.741[b]	2.000	104.000	.000	.221
	Wilks' Lambda	.779	14.741[b]	2.000	104.000	.000	.221
	Hotelling's Trace	.283	14.741[b]	2.000	104.000	.000	.221
	Roy's Largest Root	.283	14.741[b]	2.000	104.000	.000	.221
Exp'tal * Pre-test	Pillai's Trace	.040	2.148[b]	2.000	104.000	.122	.040
	Wilks' Lambda	.960	2.148[b]	2.000	104.000	.122	.040
	Hotelling's Trace	.041	2.148[b]	2.000	104.000	.122	.040
	Roy's Largest Root	.041	2.148[b]	2.000	104.000	.122	.040

The results of the Multivariate test in Table 41 showed significant effects for both treatment (experimental /control) [F(2,104) = 46.10, P,< 001, η2p = .470] and pre-test [F(2, 104) = 14.74, P < .001, η2p = .221].

The between-subjects effect tests depicted in Table 42 was analysed following significant multivariate effect for experimental and pre-test.

Table 42-*Tests of Between-Subjects' Effects*

Source	Dep Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Exp'tal	ENG 2 SCORE	5130.176	1	5130.176	14.018	.000	.118
	MATH 2 SCORE	13712.260	1	13712.260	92.912	.000	.469
Pre-test	ENG 2 SCORE	289.297	1	289.297	.791	.376	.007
	MATH 2 SCORE	4063.696	1	4063.696	27.535	.000	.208
Exp'tal * Pre-test	ENG 2 SCORE	537.086	1	537.086	1.468	.228	.014
	MATH 2 SCORE	619.591	1	619.591	4.198	.043	.038
Error	ENG 2 SCORE	38425.566	105	365.958			
	MATH 2 SCORE	15496.282	105	147.584			
Total	ENG 2 SCORE	401970.00	109				
	MATH 2 SCORE	287285.00	109				

The results indicated that there were treatment effects for both English [(F(1, 105) = 14.02, p < .001, η2p = .118], and Mathematics [F(1, 105) = 92.91, p < .001, η2p = .469]. The results for the pre-test was however significant only for the Mathematics test [F(1, 105) = 27.54, p < .001, η2p = .208]. Though the interaction effect for the multivariate test was not significant, the between subjects' effect test shown a significant interaction effect for Mathematics.

Given the significant effects of treatment for both English and Mathematics, the pairwise comparison was conducted in Table 43.

Table 43-*Pairwise Comparisons of Mathematics and English Scores*

Dep Variable	(I) Exp'tal or control	(J) Exp'tal or control	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
ENG 2	Exp'tal	Control	14.306*	3.821	.000	6.730	21.883
SCORE	Control	Exp'tal	-14.306*	3.821	.000	-21.883	-6.730
MATH 2	Exp'tal	Control	23.389*	2.427	.000	18.578	28.201
SCORE	Control	Exp'tal	-23.389*	2.427	.000	-28.201	-18.578

The results from Table 43 indicated that the experimental group had significantly higher means for both English (Mean diff = 14.31, $p < .001$) and Mathematics (Mean diff = 23.39, $p < .001$) than the control groups.

The pre-test and no pre-test groups' analysis in Table 44 also showed that the pre-test groups scored significantly higher than the no pre-test groups.

Table 44-*Pre-test/ no Pre-test Means*

Dependent Variable	Pre-test or no pre-test	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
ENG 2 SCORE	Pretest	59.839	2.834	54.219	65.459
	No pretest	56.441	2.562	51.360	61.522
MATH 2 SCORE	Pretest	55.598	1.800	52.029	59.167
	No pretest	42.865	1.627	39.638	46.091

Table 44 showed there was no significant difference between the pre-test (59.84) and no pre-test (56.44) groups with mean difference (3.40, $p = .376$)

for the English scores. The pre-test Mathematics scores (55.60) and the no pre-test (42.87) were significantly different (Mean diff = 12.73, $p < .001$). The results therefore indicated that the self-talk strategy had significant effect on Mathematics and English performance even on no pre-test groups. The hypothesis is rejected.

The findings observed with self-talk are consistent with some other studies that employed self-talk in training their subjects on problem-solving tasks in Mathematics and English. For example, Ashori and Jalil-Abkenar (2015) examined the effectiveness of self-talk (verbal self-instruction) on Mathematics problem solving with a sample of thirty ninth grade intellectually disabled boys. The results of the study showed that the experimental group (those exposed to verbal self-instruction) performed significantly better on Mathematics problem-solving than the control group, at post-test measures. In a related study, Aloysius and Cyprian (2012) investigated the effects of self-instructional strategy on students' achievements in Mathematics word problems. The study found a significant main effect of treatment (self-instructional learning strategy) on the students' Mathematical word problem achievement. Thus, the experimental group performed better than the control group that received the conventional training method. Lang, Masteopeieri, Scrugggs and Porter (2004) also presented evidence of studies on the effect of self-instructional training on algebra word problem-solving performance of students with learning disabilities, and students for whom English is a second language and students who were at risk of failing algebra. Results from the study indicated that the self-instructional group outperformed the traditional instruction group on the independent strategy use. The examples of studies cited here seem to suggest that self-talk is effective in improving subject's performance in English and Mathematics as shown in this study.

Babakhani (2011) investigated the effects of teaching the cognitive and metacognitive strategies (self-instructional procedure) on verbal Mathematics problem solving performance of primary school children with verbal Mathematics problem solving difficulties. The results of post-test revealed that the cognitive and metacognitive (self-instructional procedure) significantly improved performance of the experimental group. Rosenzweig, Krawec, and Montague (2011) also investigated the metacognitive abilities of students with LD as they engaged in Mathematics problem solving and determined processing difference between these students and their low and average achieving peers. The students thought out loud as they solved three Mathematics problems of increasing difficulty. Results indicated different patterns of metacognitive activity for ability groups when type of metacognitive verbalizations and problem-solving difficulty were considered.

In a somewhat different situation, Lee and McDonough (2015) found no significant correlation between self-talk and Mathematical achievement of their research subjects. The researchers inferred that self-talk usually increases with task difficulty, so their research subjects may have been overly familiar with the task. On the issue of over-familiarity, the present study made efforts to use familiar but not overly familiar images in order not to run into the problems of perceptual fluency. What might be of interest is the fact that almost all the other studies employed special groups, but Lee and McDonough employed regular (normal) subjects. It will be interesting for further studies to use regular subjects and perhaps compare regular and special subjects on the self-talk strategy.

It is worth noting that most of the studies described above also employed subjects of special characteristics (eg, learning disabled, subjects who have problems in Mathematics) and in this study, impulsive subjects. The impulsive pupils employed in this study remained in intact classes which may render the finding not to be a true representative of the generalized effects of self-talk on students with poor academic performance. In summary, however, the trajectory of results presented here, knitted with previous studies seem to suggest that self-talk is relevant in improving pupils performance in Mathematics and English. However, further studies are needed to enhance our understanding of this question.

Hypothesis Eight

There is no significant effect of combined strategy of cognitive modelling and self-talk training on impulsive pupils' performance in Mathematics and English.

Descriptive information for English and Mathematics for the group that had the combination of self-talk and cognitive modelling intervention indicated that the scores on the English test for the experimental group were almost equal for the pre-test (Mean = 67.69, SD = 9.72) and no pre-test groups (Mean = 67.06, SD = 12.89). However, the experimental group pre-test scores seemed to be quite higher than the no pre-test group's scores of the control group (Mean = 55.36, SD = 12.93). For the Mathematics test scores, the pre-test group's means (Mean = 52.50, SD = 22.19) were lower than that of the no pre-test group (Mean = 63.52, SD = 14.98) for the experiment groups, but the reverse was the case for the control groups.

The two-way MANOVA was used to test the effectiveness of the combined intervention on Mathematics and English performance. Given that the covariance was equal across groups of the independent variables [Box's M = 14.161, p = .147], the Wilk's λ lambda statistics were reported in Table 45.

Table 45-*Multivariate Tests of Effects of Combined Strategy*

Effect		Value	F	Hypo df	Error df	Sig.	η2 p
Exp'tal	Pillai's Trace	.049	1.743^b	2.000	68.000	.183	.049
	Wilks' Lambda	.951	1.743^b	2.000	68.000	.183	.049
	Hotelling's Trace	.051	1.743^b	2.000	68.000	.183	.049
	Roy's Largest Root	.051	1.743^b	2.000	68.000	.183	.049
Pre-test	Pillai's Trace	.134	5.267^b	2.000	68.000	.007	.134
	Wilks' Lambda	.866	5.267^b	2.000	68.000	.007	.134
	Hotelling's Trace	.155	5.267^b	2.000	68.000	.007	.134
	Roy's Largest Root	.155	5.267^b	2.000	68.000	.007	.134
Exp'tal * Pre-test	Pillai's Trace	.115	4.411^b	2.000	68.000	.016	.115
	Wilks' Lambda	.885	4.411^b	2.000	68.000	.016	.115
	Hotelling's Trace	.130	4.411^b	2.000	68.000	.016	.115
	Roy's Largest Root	.130	4.411^b	2.000	68.000	.016	.115

The multivariate Manova test in Table 45 showed no significant effect for treatment [(F(1, 69) = 1.743b, p < .001, η2p = .049]. There was however, significant multivariate pre-test [F(1, 69) = 5.267b, p < .001, η2p = .134] and interaction effects [F(1, 69) = 4.416b, p = .016, η2p = .115]

The Levene's test indicated that there was equality of error variance for Mathematics, but not for English score.

The between-subjects effects test presented in Table 46 showed no significant treatment effects for both English and Mathematics.

Table 46-*Test of Between -Subjects' Effects*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	η2 p
Exp'tal	ENG 2 SCORE	356.698	1	356.698	2.793	.099	.039
	MATH 2 SCORE	4.941	1	4.941	.016	.898	.000
Pre-test	ENG 2 SCORE	1051.028	1	1051.028	8.231	.005	.107
	MATH 2 SCORE	27.088	1	27.088	.090	.765	.001
Exp'tal * Pre-test	ENG 2 SCORE	887.128	1	887.128	6.947	.010	.091
	MATH 2 SCORE	1654.076	1	1654.076	5.502	.022	.074
Error	ENG 2 SCORE	8811.131	69	127.698			
	MATH 2 SCORE	20742.030	69	300.609			
Total	ENG 2 SCORE	326400.000	73				

a. *R Squared = .183 (Adjusted R Squared = .147)*

b. *b. R Squared = .082 (Adjusted R Squared = .042)*

There were, however, pre-test effects for English scores and interaction effects for both English and Mathematics scores (Table 46). Given significant interaction effects for both English and Mathematics test, the simple effects tests were conducted for both subjects in Table 47.

Table 47-*Pairwise Comparison for English and Mathematics Tests*

Depen. Variable	Pre-test or no pre-test	(I) Exp'tal or control	(J) Exp'tal or control	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
ENG 2 SCORE	Pretest	Exp'tal	Control	-2.620	3.591	.468	-9.783	4.543
		Control	Exp'tal	2.620	3.591	.468	-4.543	9.783
	No pretest	Exp'tal	Control	11.702*	4.078	.005	3.566	19.838
		Control	Exp'tal	-11.702*	4.078	.005	-19.838	-3.566
MATH 2 SCORE	Pretest	Exp'tal	Control	-10.313	5.509	.065	-21.303	.678
		Control	Exp'tal	10.313	5.509	.065	-.678	21.303
	No pretest	Exp'tal	Control	9.244	6.257	.144	-3.239	21.727
		Control	Exp'tal	-9.244	6.257	.144	-21.727	3.239

From Table 47, the English test showed no significant difference between the experimental and control groups (Mean diff = 2.62, p = .468) for the groups that were pre-tested. However, the experimental group had a significantly higher score than the control group (Mean diff = 11.70, p = .005) for the groups that were not pre-tested.

It appears that the combined strategy was effective when there was no pre-testing for the English test. For the Mathematics test, however, there were no significant differences between the experimental and control groups for both pre-tested and no pre-tested groups. The combined strategy therefore was not effective for Mathematics performance, whether there was pre-test or no pre-test. The scores for pre-tested and no pretested groups were compared in Table 48.

Table 48-*Pairwise Comparison Between Pre-test/no Pre-test Scores*

Dep Variable	Exp'tal Or Control	(I) Pre-test or no pre-test	(J) Pre-test or no pre-test	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b] Lower Bound	Upper Bound
ENG 2	Exp'tal	Pretest	No pretest	.633	3.525	.858	-6.398	7.665
		No pretest	Pretest	-.633	3.525	.858	-7.665	6.398
	Control	Pretest	No pretest	14.955*	4.135	.001	6.705	23.205
		No Pretest	Pretest	-14.955*	4.135	.001	-23.205	-6.705
MATH 2	Exp'tal	Pretest	No pretest	-11.029*	5.408	.045	-21.818	-.241
		No Pretest	Pretest	11.029*	5.408	.045	.241	21.818
	Control	Pretest	No Pretest	8.527	6.345	.183	-4.131	21.185
		No pretest	Pretest	-8.527	6.345	.183	-21.185	4.131

Comparing English test performance of the experimental and control groups in Table 48, regarding whether pre-test was done or not, there was no significant difference between pre-test and no pre-test groups (Mean diff = 0.633, p = .858) for the experimental groups. There was, however, significant difference between pre-test and no pre-test groups for the control groups (Mean diff = 14.96, p = .001), with the pre-test groups having higher scores than the no pre-test group. For Mathematics, there was significant difference between pre-test and no pre-test groups (Mean diff = 11.03, p = .045) for the experimental group, with the pre-test group having lower score; however, there was no difference for the control group. The pre-test thus had a mixed sensitisation effect in this case. Pre-testing did not help (lower score) the experimental group in Mathematics, but positively sensitized the control group in the English test. The null hypothesis is rejected.

The test showed a significant effect in Mathematics, but none in English. According to Bear and Nietzel (1991), by 1989, 25.4% of studies included in their meta-analytic review of literature from studies in treatment of children with impulsivity, used combined strategies. For some of the studies, the combined strategy acted like a fail-safe strategy, because it usually yielded better performance than a single strategy. Meichenbaum (1971), for instance, achieved success in his experiment by adding self-talk training to the cognitive modelling strategy. Olasehinde (1986) also trained impulsive students in three cognitive strategies - modelling with self-instructions (MSI), Self-Instructions alone (SI) and Programmed Instruction (PI) - to investigate the comparative effectiveness of the three training procedures for modifying the cognitive disposition of those students. She found significantly higher positive results with the modelling plus self-instruction group than the other intervention groups. Ammer (1983) used the same strategies as this study and reported positive results. Gargallo (1993), combined three strategies of forced delay, teaching adequate scanning strategies and teaching strategies for verbal self-control using internal speech, and he reported success. The results obtained from this hypothesis are however inconsistent with what has been reported in literature. Here, it appears that the combined strategy was effective only when there was no pretesting for English. In the area of Mathematics, no improvements were shown by the experimental groups, whether pretested or not.

The contradictory findings reported here might have resulted because of the nature of the therapy used. In Meichenbaum (1971) the combined strategy somewhat blended the processes of modelling plus self-talk with modifications on the individual strategies that eventually made the combined a well organised and a complete set of therapy (like a single strategy). In the present circumstances, the combined strategy simply used the modelling therapy (all the processes involved in modelling) and concurrently manipulated the self-talk (all the processes involved in self-talk) procedures within the same group. This may have revealed certain inherent flaws in both strategies that combated the intended benefits assumed to have received from using a two-in-one strategy.

In addition, all the models (teachers) were given a period of three weeks of training in whatever strategy they were prepared for. In the case of those who used the combined, they were taught both self-talk and modelling within the same three weeks. It is possible that, the teachers (models) who were trained in the combined could not grasp the content well to impact it to their subjects. Hence, the contradictory findings could be as a result of teacher (model) factor but not necessarily a problem of the therapeutic procedures.

Hypothesis Nine

There is no significant relationship between impulsive behaviour and pupils' performance in English Language and Mathematics.

This hypothesis tested the relationship between impulsive behaviour and academic performance in English and Mathematics. Pearson Product moment correlation coefficient 2-tailed was used to measure the relationship between impulsivity (MFFT accuracy and response time) and academic performance. The results are illustrated in Table 49.

Table 49-*Pearson Product Moment Correlation*

	1	2	3	4	5	6	7	8	9	10
1. MFFT1	1									
2. RTIME1	.589**	1								
3. ENG 1	-.001	.004	1							
4. MATH1	.132	.129	.257**	1						
5. MFFT 2	.266**	.377**	.075	-.015	1					
6. RTIME 2	.110	.237**	.052	.113	.665**	1				
7. ENG 2	.177*	.201*	.474**	.343**	.277**	.233**	1			
8. MATH 2	.128	.265**	.143	.558**	.221*	.279**	.252**	1		
9. MFFT 3	.186*	.455**	.116	.076	.682**	.367**	.178*	.198*	1	
10. RTIME 3	.045	.116	.201*	.095	.304**	.400**	.254**	-.044	.341**	1

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

Pre-test scores are represented with 1; Post-test, 2 and Delayed post-test, 3. For instance, MFFT 1 represents pre-test MFFT

The results showed a significant positive relationship between Rtime 1 and MFFT 1 ($r = .589$, $p < .001$). Thus, as response time increased, the MFFT accuracy also increased. There was no relationship between MFFT 1 and English 1, Mathematics 1 (English1 r= .001, p = 987; Mathematics1 r = .132, p = .129). For the post test, the same trend between Rtime 2 and MFFT 2 occurred. A high positive significant relationship was observed ($r = .665$, $p < .001$). The relationship between MFFT 2 and academic performance scores on both Mathematics 2 scores ($r = .221$, $p = .010$ and English test ($r = .277$, $p < .001$) was also significant. A significant positive relationship was observed between Rtime 2 and Mathematics 2 ($r = .279$, $p < .001$) and English scores ($r = .233$, $p = .007$). The hypothesis was accordingly rejected.

This investigation observed a significant positive correlation between the measures of impulsivity (the MFFT accuracy scores and response time) in the pre-test. Whenever pupils spent more time on their responses, their accuracy scores were also higher. Before the cognitive interventions, there was no relationship between impulsivity measures and academic performance in English and Mathematics. After impulsivity was modified by the interventions, the relationship between MFFT 2 scores and Rtime 2 was significantly higher.

Research (Nwamuo, 2010; Nkrumah, 2013) has shown that improved self-control can improve academic achievements of impulsive children. The present hypothesis looked at objectively measured teacher-made test in Mathematics and English as the focal outcome of self-control training interventions. The findings show that improved impulse control (as measured by MFFT response time and accuracy) may have positive effects on pupils' performance in Mathematics and English.

Impulsivity has been associated with academic performance in the context of attention deficits, though its influence on a large spectrum remains unexplored, particularly in the context of Mathematics and English learning. Mathematics and English were hypothesised to be more challenging for impulsive pupils since it requires the practice and repetition of tasks as well as concentrated attention to task. The large negative effect size observed for impulsive children in their problem solving, was opposed by an increase in their response time. The results obtained here offer that impulse control may benefit impulsive pupils who struggle with English and Mathematics. Together, this hypothesis test suggests important interconnected roles for impulse control that can influence primary school pupils English and Mathematics trajectories.

It is interesting to note that there seem to have been many successful trials in behavioural strategies with Mathematics as compared to other subjects. The results for the performance tests in English and Mathematics seemed to tilt the strategies in favour of Mathematics. This may suggest that most strategies work better in subject areas that follow specific procedures than in subjects which do not follow specific procedures and even have exceptions to rules. Even though the views of teachers who trained the children to self-talk were not sought in the study, informal conversations with the researcher revealed that they found the cognitive strategies worked better with certain subject areas (such as Mathematics, ICT and Science) more than others (English and Social Studies). This could be as a result of the fact that Mathematics and related subjects, were more process based than English and related subjects.

Another observation that was made here regards the improved academic performance shown by the experimental groups after intervention was felt more in Mathematics than in English. As already indicated, Mathematics require a lot of impulse control relative to English. In Mathematics, sometimes pupils may know the approach to solve a problem but a simple inability to wait can result in errors, especially in problems of addition requiring carry overs (at this level). English is not like that because it is unusual for an impulsive child to put up a wrong statement when the answer is known.

In the same fashion, longer response time resulted in better performance on the Mathematics and English tests. Response time for Mathematics 2 was much higher than for English 2. The researcher speculates that the reason could be as a result of different attitudes required for Mathematics and English performance. Mathematics is made up of procedures that are quite fixed and rigid. The only way to get high scores is to go through those procedures just as they are given. That requires a delay in responding in order to reflect, follow the procedures closely and come out with accurate scores. The situation is very different in English where there are various ways to put across the same sentence and doesn't require any fixed procedures because it depends more on the specific context.

Summary of Key Findings

Impulsive children have been shown to have academic deficits that are linked to their poor impulse control. Understating the nature of mental representations and control deficits exhibited by impulsive children serves as a foundation for constructing adequate models of impulsive behaviour modification. Further, investigations into cognitive control strategies such as those manipulated in this study provide unique opportunities that could be incorporated into educational practice.

The present study enabled the researcher to examine three strategies for modifying impulsivity (cognitive modelling, self-talk and a combination of self-talk and cognitive modelling). The first three hypotheses tested the efficacy of the strategies in modifying subjects' problem-solving abilities as measured by the MFFT accuracy and response time. All the strategies were found to have positive impact on the experimental subjects' problem-solving abilities. Some other intriguing findings inherent in the study were the fact that the findings subsisted at the delayed post-test measures. Thus, the subjects' new problem-solving skills were sustained even after cessation of treatment.

Hypotheses four compared the independent strategies of modelling and self-talk to check for superiority between the two strategies in terms of impulsive behaviour modification. The hypothesis found no significant difference between the use of modelling and self-talk. In precis, the fourth hypothesis implied that neither of the strategies (modelling and self-talk) was superior (in terms of impulsive behaviour modification) over the other. However, it was noticed that in terms of its effectiveness as measured by the MFFT (response time and accuracy score), the modelling strategy showed more improvement in delayed response at the detriment of accuracy scores. On the other hand, the self-talk strategy showed more improvement towards accuracy scores at the expense of response time. Put another way, although both strategies were effective (as measured by the MFFT), the subjects who underwent modelling training showed more delayed response better than accuracy scores. Also, the subjects who were exposed to self-talk showed more improved accuracy scores than delayed response. Research hypothesis five also found that a combined strategy of self-talk and modelling was not superior (in modifying impulsivity) over the use of a single strategy (either self-talk or modelling). In other words, it is sufficient to employ either of the two strategies without necessarily combining the two.

Research hypothesis six and seven tested the effect of the modelling and self-talk techniques on pupils' performances in Mathematics and English. The modelling method was found to have significant effect on pupils' performance in Mathematics but not in English. Thus, cognitive modelling was effective in improving pupils approaches to problem solving in Mathematics only. The self-talk strategy however, showed significant impact in pupils' performances in both English and Mathematics.

Finally, research hypothesis eight tested the combined effect of modelling plus self-talk on pupils' performance in English and Mathematics. It was found that the combined strategy had a positive effect on English, but only for the experimental group that was not pretested. In terms of Mathematics, the combined strategy had no effect on pupils' performance whether the group was pretested or not. In hypothesis nine, the modification of impulsive behaviour was seen to have positive effect on pupils' performance in English and Mathematics. Thus, in general, impulsive behaviour modification has a significant positive impact on pupils' performance in English and Mathematics.

The results of the nine hypotheses are summarized as follows:

H_1. Cognitive modelling had an effect on the problem-solving abilities of the subjects by reducing the impulsivity (as measured by increased response time, increase accuracy) among primary school children.

H_2. Self-talk training had an effect on problem solving abilities of the subjects by reducing the impulsivity (as measured by increased response time, increase accuracy) among primary school children.

H_3. A combined strategy of cognitive modelling plus self-talk had an effect on problem solving abilities of the subjects by reducing the impulsivity (as measured by increased response time, increase accuracy) among primary school children.

H_4 There was no significant difference between the effectiveness of cognitive modelling and self-talk training in modifying the problem solving abilities of impulsive children.

H_5 There was no significant difference between the effects of a single reflective teaching strategy and a combined teaching strategy on the problem solving abilities of impulsive children.

H_6 There was significant effect of cognitive modelling on impulsive pupils' approach to problem solving in Mathematics but not in English.

H_7 There was significant effect of self-talk training on impulsive pupils' approach to problem solving in Mathematics and English.

H_8. There was significant effect of the combined strategy of cognitive modelling and self-talk training on impulsive pupils' approach to problem solving in Mathematics but not in English.

H_9. There was significant positive relationship between impulsive behaviour modification and academic performance in English and Mathematics.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study assessed the effect of training in reflective strategies in modifying impulsive behaviour among children. The reflective training strategies employed herein were cognitive modelling, self-talk, and a combination of cognitive modelling and self-talk.

The study tested nine hypotheses. The Solomon Four Group Design was used for the study. The design involved a standard pre-test-post-test two-group design and a post-test only design. The target population for the study was primary school children in Ghana. Tamale Metropolis in the Northern region of Ghana was conveniently selected for the study. A sample size of 275 primary four pupils (127 males, 148 females), aged between 8 and 11 years, with impulsive characteristics were purposively selected for the study.

The pupils identified as impulsive were screened with a battery of impulsive related questionnaires (NICHQ, CIFP, IRQC) that were completed by teachers, parents and the pupils themselves. Three versions of the MFFT-20 were used for pre-test, post- and delayed-post tests to assess the levels of impulsivity in the children. A set of pre- and post- performance tests in Mathematics and English were administered. Hypotheses were analysed using between and within group MANOVA and Pearson Product moment correlation coefficient.

The three cognitive strategies that were tested in the study were all significant in reducing impulsivity among the subjects and improving their problem-solving abilities. None displayed a higher effectiveness over the others. This was seen in the improved results also on the performance tests in English and Mathematics.

Conclusions

Cognitive thinking strategies normally develop before children enter adolescence. If the journey there is to be a smooth one, what children will need most include reflective thinking, not only for academic work but also for avoidance of risky decision-making. Pupils in the regular classrooms who, due to their impulsive behaviours are often set aside as underachievers, who have to just be pushed from class to class or be frequently repeated, can function like their peers if they are given the needed assistance. This study suggests a concerted formalised teaching and practice strategy may be needed by a quite a number of children to get to the academic level expected by the general standard. For these children, mastery learning may be impossible unless they are formally trained how to learn. In recent educational reforms, the classroom is expected to practice inclusion of children with some level of special needs. Teachers will need the help of proven alternative approaches to teaching and learning, such as the strategies used in this study.

The cognitive behaviour modification strategies of cognitive modelling, self-talk and a combined strategy of the two, that were used in this study have all been effective for use in the Ghanaian classroom situation. The reflective characteristics acquired were sustained even to the delayed post-test.

By itself, cognitive behaviour modification strategies for self-initiated appropriate attending to cognitive tasks will not eliminate a pupil's learning deficits. Neither will it guarantee that learners will fully make use of their cognitive skills. Students were not cured of some condition which prevented learning from occurring. Educators still need to explore the world of children in search of answers to learning problems. This study investigated options for improving the academic performance of underachieving impulsive pupils. The results suggest the potential exists for incorporating these strategies into the educational programs for all children.

In my opinion, improvement in the children's problem solving ability may have been much higher and have lasted much longer if the intervention had been sustained for a longer period. It takes time and constant practice to learn strategies and develop automaticity in them.

Previous assessments of impulsivity focussed on parents and teachers as key informants. The Vanderbilt Assessment Scale, which was adapted for this study assessed only those two groups as informants. This study employed the use of the children themselves as informants, thus affirming the fact that they can recognize the negative behaviour of impulsivity within and assess themselves when given the opportunity.

This study, along with the only other one on cognitive modelling research (Nkrumah, 2013) in Ghana, demonstrates by the sample sizes that classroom impulsivity may involve higher numbers than meets the eye, and as such needs critical attention.

The MFFT 20 which is still a relatively novel instrument in the Ghanaian context, was successfully used to the measure the levels of impulsivity in the children before and after the interventions. As it employs the use of only pictures, the children did not find it intimidating as in other assessments they have been taking, and actually enjoyed using them.

The cognitive behaviour modification strategies of cognitive modelling, self-talk and the combined method were all able to shape the children's impulsive behaviour by causing them to delay and reflect over their responses. This is one of the key characteristics that differentiate impulsive children from reflective ones. The reflective thinking was seen in the increased scores after the behaviour modification training. It is important to note that all the strategies delayed responding, even though merely delaying responses may not necessarily indicate reflectivity. This study proved that reflective thinking strategies are necessary for increasing problem solving and decision making.

All children benefit from instruction, but some children need incredible amounts of careful, personal instruction, with clear and repeated demonstrations of how they should go about their learning and performance of cognitive tasks. Left without adequate demonstrations, struggling impulsive learners are likely to continue trying to make sense out of lessons, but rarely will they accomplish this feat.

Besides giving impulsive children a new potential for performing, the strategies used in this study provides children with self-directed problem-solving strategies that increase the possibility for all children to maximise their learning potential for school success.

Recommendations

The problem of classroom impulsivity is too pronounced to be continually ignored in the Ghanaian primary schools. The condition yields undesirable consequences for children and cripple their academic achievement; the real essence of their being in school. It is therefore recommended that:

1. Schools, in collaboration with educational psychologists should organize remedial programmes for children where reflective practices could be taught and its importance emphasized.

2. Teachers need to have clear knowledge of impulsive characteristics that are displayed in the classroom setting so that they could help identify such children before they graduate into other unmanageable disorders. The questionnaires used in this study could be a source of information to stakeholders.

3. Teachers should seat impulsive children close to peers who demonstrate desirable behaviours for them to imitate.

4. Behaviour modification strategies should not be a day's practice. It should be done for weeks as seen in this work. Follow-ups are also important for constant monitoring of progress of treated pupils.

5. Parents and teachers should praise other children who demonstrate desirable behaviours in order to signal or draw other pupils' attention to what is expected of them in the classroom.

6. Positive self-talks help to achieve target behaviours, and teachers can make use of that in the classroom.

7. Teachers should be given training to increase their awareness of reflective teaching, avoid the barriers by having a clear understanding of reflective teaching and its implementation and improve its practice.

Other recommendations that could be made due to observations noted in the course of the study are:

8. The Ghana Education Service stipulated maximum class size of 35 must be strictly enforced in order to restrict the spread of impulsivity among children (where a few exist in the classroom).

9. Teachers should not respond to a child when he/she blurts out appropriately or seek attention in impulsive and disruptive ways. Instead, apply the consequences of the behaviour plan.

10. Also, the classroom should not contain fixed or permanent sitting places for children. The place a pupil sits during lessons should be based on the behaviour at that time.

11. Teachers are expected to provide feedback on both the content and process of the learners' own reflective practice and provide an environment that encourages reflective practice

12. Schools should invite resource persons like educational or cognitive psychologists to train teachers in reflective practices.

13. Designers of methodology content for training of teachers should place more emphasis on reflective teaching strategies so teachers imbibe that more and move away from strategies that engender rote learning.

Suggestions for Further Studies

Any researcher interested in the area of cognitive style modification could investigate parental factors that affect child behaviour and learning. Additionally, the teachers' perception and actual use of reflective teaching practices could be examined.

Future research could consider younger and older children in order to examine if developmental differences exist in impulsivity. Gender differences could be examined because of low prevalence of ADHD among girls and this could be both biological and socio-cultural, as well as gender responses to interventions.

This study focused on public schools as a matter of convenience. Other researchers can explore the strategies employed herein in the private schools.

There could also be further studies that will replicate the strategies used in this study with an adult population. Finally, there are other strategies for cognitive behaviour modification, all which could also be investigated for their effectiveness.

Contribution of the Research to Knowledge and Practice

This study explored the effect of three reflective thinking strategies on the problem solving abilities of impulsive children. Findings from the study has made significant contribution to literature and practice. It has engendered further discourse thereby advancing the frontiers of knowledge.

As far as the researcher knows, only one research in impulsive behaviour modification has been conducted in Ghana (Nkrumah, 2015) and that study employed only one training strategy, cognitive modelling. All the available studies in impulsive behaviour modification were conducted in the Western, Asia, and the Oceania. This served as one of the motivations for the present study. By employing a population that is not from a Western, educated, industrialised, rich democratic society, this thesis expands our understanding about impulsive behaviour modification to a Ghanaian ecology, and thus brings the study of cognitive style modification to a new destination.

Although the instruments employed in this study were predominantly adapted, the researcher modified the instruments to mimic the nature and child cultural practices in the Ghanaian ecology. It is understood that the characteristics of children in Ghana are different from those in other ecologies and such differences are capable of misdiagnosing impulsivity in different contexts. The adapted instruments could be used by other researchers in Ghana who are interested in this area of study.

Again, the training strategies (Cognitive Modelling, Self-Talk, Combined Cognitive Modelling and Self-Talk) were adapted to suit the pedagogical and classroom management strategies predominantly employed in Ghanaian schools. All these were done in efforts to make the training packages ecologically friendly so that they could be conveniently adopted by teachers in Ghanaian schools.

The study has engendered discourse in cognitive style modification in general. Quite enthralling was the finding that whereas the training strategies were effective in modifying pupils' problem solving approaches, and subsequent performances in English and Mathematics, cognitive modelling did not significantly improve subjects' performance in English although there were gains in Mathematics. The researcher speculated that the procedures involved in Mathematics in Primary Four (examples when addition and subtraction involves carry-overs) require more impulse control than with English language. Further studies are required to enhance our understanding of this novel finding.

Again, the study has stimulated discussions on the relevance to introduce a course on reflective thinking for trainee teachers. If harnessed properly, there could be advocates for licensure examination course in this area of study just as critical thinking was introduced as a core course in the universities.

Further, there are arguments that cognitive style modification while consistently being successful with self-instructional training, has not been effective with social learning strategies. One aim of the present study was to attempt to tease apart these two conflicting models of cognitive behaviour modification. This study is relevant because it has made significant theoretical contribution to the discourse on cognitive style modification by showing that self-instructional training were equally as effective as social learning strategies.

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APPENDICES

APPENDIX A

LETTER OF INTRODUCTION

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF EDUCATIONAL FOUNDATIONS
DEPARTMENT OF EDUCATION AND PSYCHOLOGY

Telephone: 0332091697
Email:dep@ucc.edu.gh

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

28th September, 2016

Our Ref:

Your Ref:

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION
MS. EUNICE TORTO-SEIDU

We introduce to you **Ms. Torto-Seidu**, a student from the University of Cape Coast, Department of Education and Psychology. She is pursuing Doctor of Philosophy Degree in Educational Psychology and she is currently at the thesis stage.

Ms. **Torto-Seidu** is researching on the topic: **EFFECTS OF REFLECTIVE TEACHING STRATEGIES ON COGNITIVE TASK PERFORMANCE OF IMPULSIVE CHILDREN."**

She has opted to collect or gather data at your institution/establishment for her Thesis work. We would be most grateful if you could provide her the opportunity and assistance for the study. Any information provided would be treated strictly as confidential.

We sincerely appreciate your co-operation and assistance in this direction.

Thank you.

Yours faithfully,

Theophilus A. Fiadzomor
Principal Administrative Assistant
For: **HEAD**

APPENDIX B

ETHICAL CLEARANCE

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
ETHICAL REVIEW BOARD

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: CES/ERB/CR/Vol 1/004

Your Ref: ....

Date: April 7, 2016

Chairman, CES-ERB
Prof. J. A. Omotosho
jomotosho@ucc.edu.gh
0243784739

Vice-Chairman, CES-ERB
Prof. K. Edjah
kedjah@ucc.edu.gh
0244742357

Secretary, CES-ERB
Dr. (Mrs.) L. D. Forde
lforde@ucc.edu.gh
0244786680

....

....

....

Dear Sir/Madam,

ETHICAL REQUIREMENTS CLEARANCE FOR RESEARCH STUDY

The bearer, Eunice Torto-Seidu .... Reg. No ED/EPY/14/0002 is an ~~M.Phil~~ /Ph.D student in the Department of Education and Psychology ...., College of Education Studies, University of Cape Coast, Cape Coast, Ghana. ~~He~~/She wishes to undertake a research study on the topic Effects of reflective teaching strategies on cognitive task performance of impulsive children.

The Ethical Review Board (ERB) of the College of Education Studies (CES) has assessed the proposal submitted by the bearer. The said proposal satisfies the College's ethical requirements for the conduct of the study.

In view of the above, the researcher has been cleared and given approval to commence ~~his~~/her study. The ERB would be grateful if you would give ~~him~~/her the necessary assistance that may be needed to facilitate the conduct of the said research.

Thank you.
Yours sincerely.

Dr. (Mrs.) Linda Dzama Forde
(Secretary, CES-ERB)

APPENDIX C

CONSENT FORM

The above document describing the benefits, risks and procedures for the research title

EFFECTS OF REFLECTIVE STRATEGIES ON PROBLEM SOLVING OF IMPULSIVE CHILDREN has been read and explained to me. I have been given the opportunity to ask any questions about the research to my satisfaction. I agree for my ward and I to be a part of this study.

Date Name and signature of parent

If participants cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the participant. All questions were answered and the participant agreed to take part in the research with the ward.

Date Name and signature of witness

I certify that the nature and purpose, potential benefits and possible risks associated with participating in this research have been explained to the above individual.

Date Name and signature of person who obtained consent

APPENDIX D

NICHQ – Vanderbilt Assessment Scale – Teacher Informant

Instruction: Items on this questionnaire show a list of behaviours exhibited by children. Please honestly fill it, for the information you provide will help the researcher to assist the child perform and develop well.

Section A

Please supply the necessary information in the spaces provided.

Teacher's Name: ____

School: ________________________________Teacher's Gender: ____

Child's Name:

____

Child's Gender: _____________________ Class: ___________________

Please tick the best option in the spaces provided as applies to the child.

s/n	Symptoms	Never	Occasionally	Often	Very often
1.	Does not follow through on instructions and fails to finish schoolwork, (not due to oppositional behaviour or failure to understand)				
2.	Has difficulty organising tasks and activities				
3.	Is forgetful in daily activities				

4.	Loses items necessary for tasks or activities easily (pens, pencils, books)				
5.	Gets angry easily				
6.	Talks excessively				
7.	Blurts out answers before questions have been completed				
8.	Likes fighting.				
9.	Calls out frequently in class with wrong answers.				
10.	Spiteful and vindictive				
11.	Fails to give attention to details or makes careless mistakes in class.				
12.	Is easily distracted by extraneous stimuli				
13.	Interrupts his/her colleagues (e.g. in conversation, play activities				
14.	Avoids tasks that requires sustained effort.				
15.	Has difficulty waiting his/ her turn in events.				

	Problem solving ability	**Excellent**	**Above average**	**Average**	**Somewhat of a problem**	**Problematic**
16.	Reading					
17.	Mathematics					
18.	Written Expression					
	Classroom behavioural performance	**Excellent**	**Above average**	**Average**	**Somewhat of a problem**	**Problematic**
19.	Assignment					
20.	Relationship with peers					
21.	Following directions					
22.	Organizational Skills					
23.	Disrupting Class					

Thank you.

APPENDIX E

CHECKLIST ON IMPULSIVENESS FOR PARENTS (CIFP)

Instruction: This questionnaire is meant to gather information about your child. Please honestly fill it, for the information you provide will help the researcher to assist the child perform and develop well

Section A

Please supply the necessary information in the spaces provided.

Parent's Name: ____

Gender:_______________________ Age: __________________________

Educational Level: ____

Child's Name: ____

Child's Gender: _____________________ Class: __________________

Section B

Please tick the best option in the spaces provided as applies to the child.

s/n	**Symptoms**	**Never**	**Sometimes**	**Often**	**Very Often**
1.	Fails to give attention to details or makes careless mistakes in activities (e.g. household chores)				
2.	Has difficulty sustaining attention on tasks like watching television				
3.	Does not seem to listen when being spoken to.				

4.	Does not follow through with instructions and fails to finish homework.				
5.	Has difficulty organising tasks and activities.				
6.	Avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort				
7.	Loses things easily (e.g toys, pencils, money)				
8.	Is easily distracted by outside stimuli				
9.	Is forgetful in daily activities (e.g. buys wrong things when sent on errands)				
10.	Cannot sit at one place to complete a task.				
11.	Has difficulty playing quietly				
12.	Responds to questions before they are completed				
13.	Has difficulty waiting his/her turn.				

14.	Interrupts or intrudes on others such as blurting into conversations.				
15.	Talks too much				
16.	Like to quarrel				
17.	Reacts violently on the slightest provocation				
18.	Gets angry easily				
19.	Does not take good care of things				
20.	Is rejected by friends during play				

Thank You

APPENDIX F

IMPULSIVE RELATED QUESTIONNAIRE FOR CHILDREN (IRQFC)

Instruction: This questionnaire is meant to gather information about you. Please honestly fill it, for the information you provide will help the researcher to assist you perform and develop well

Name: ____

School: ____

Age: ______________________________ Class: _____________

Gender: Boy ( ) Girl ( )

Tick 'often' or 'sometimes' in the columns provided as applies to you.

s/n	Symptoms	Often	Sometimes
1.	I easily make mistakes in class work.		
2.	I move about in the classroom when teacher is teaching		
3.	I cannot play alone quietly.		
4.	Awaiting my turn during play is difficult for me.		
5.	I feel sad after insulting my friends.		
6.	My school items easily get lost.		
7.	I do not do well in my academic work at school.		
8.	I find myself doing things I do not want to do.		

9.	I do not like class work that takes a long time for me to finish.		
10.	I interrupt my friends when they are conversing.		
11.	My friends easily annoy me.		
12.	My things get spoilt easily (like my school bag and books)		
13.	I like quarrelling.		
14.	I like climbing objects (like chairs, trees)		
15.	I like to answer questions before they are finished.		
16.	My classmates do not like to play with me.		
17.	I like conversing a lot.		
18.	I do not like to sit at one place for a long time.		
19.	I easily forget things.		
20.	I like to submit my classwork early.		

APPENDIX G

TREATMENT PROGRAM EVALUATION QUESTIONNAIRE (TPEQ)

Instruction: This questionnaire is designed to assess your view about the research that you have participated in. Please fill it honestly so that the researcher could improve on the programme where necessary.

Name: ____

School: ____

Age: _______________________ Class: ________________

Gender: Boy ( ) Girl ( )

1. How do you see your participation in this programme?

   Interesting ( ) Boring ( )

2. Has this programme affected you positively?

   Yes ( ) No. ( )

3. Have you seen any change in the way you solve problems since you took part in this programme?

   Yes ( ) No. ( )

4. Would you recommend this programme to other impulsive children you know?

   Yes ( ) No ( )

5. Do you think this programme has helped improve your academic performance in school?

   Yes ( ) No. ( )

6. Has this programme helped you to pay attention during lessons?

   Yes ( ) No ( )

7. Which part of the programme do you think should be removed?

   Testing ( ) Lesson activities ( ) Homework ( ) None ( )

8. Do you think this programme should be included in your regular school programme?

   Yes ( ) No. ( )

9. Have you made any commitment to change your attitude to problem solving as a result of this programme?

   Yes ( ) No. ( )

10. Which aspect of the programme do you like most?

    Testing ( ) Lesson activities ( ) Homework ( ) None ( )

Thank you.

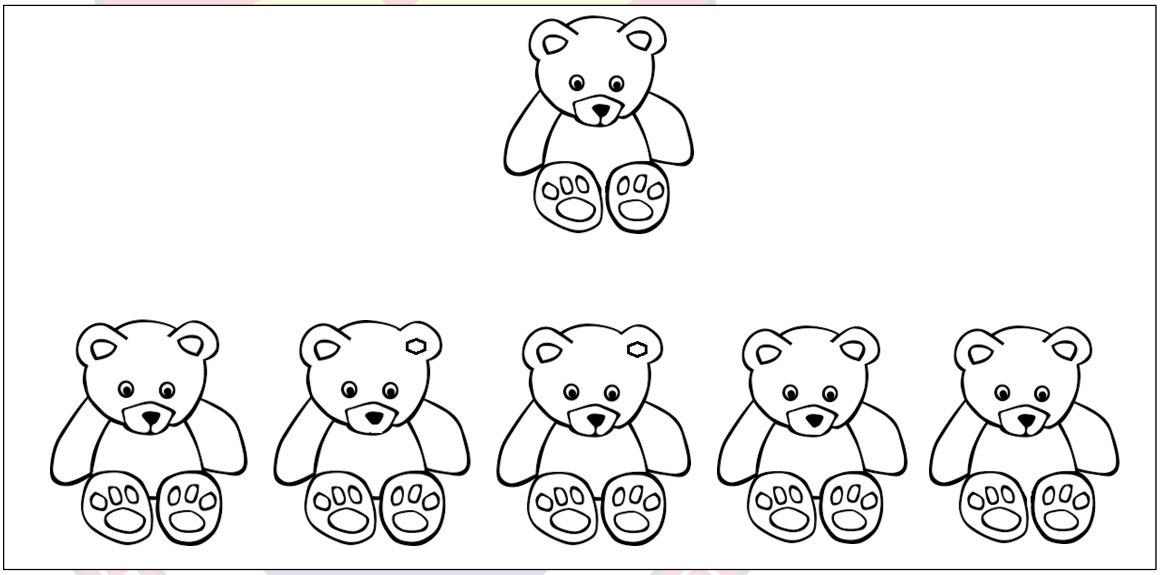
APPENDIX H

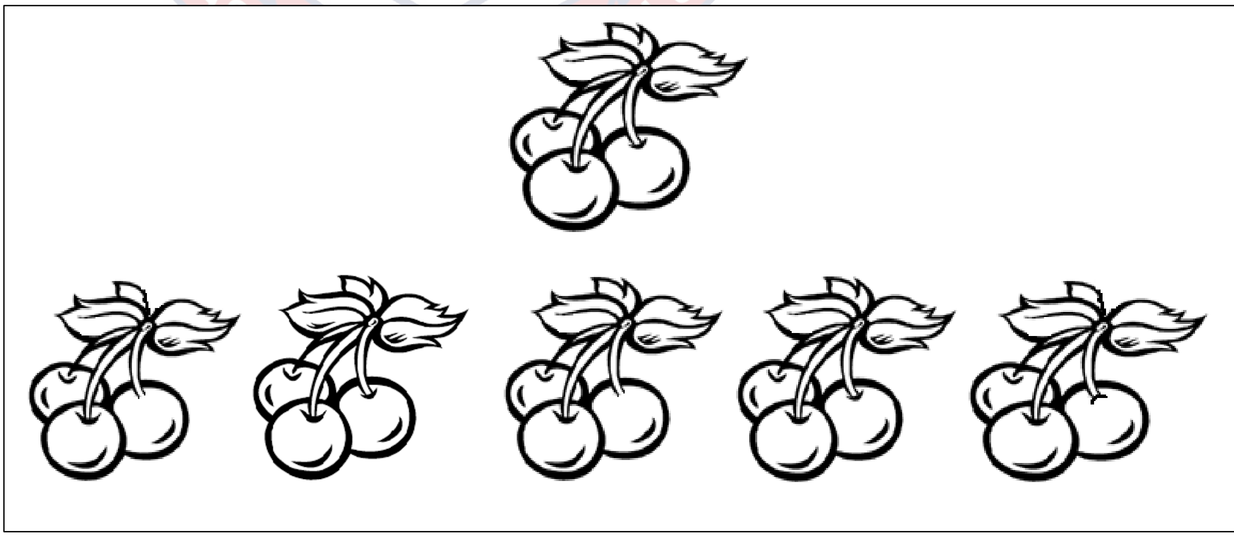
SAMPLE MFFT INSTRUMENT

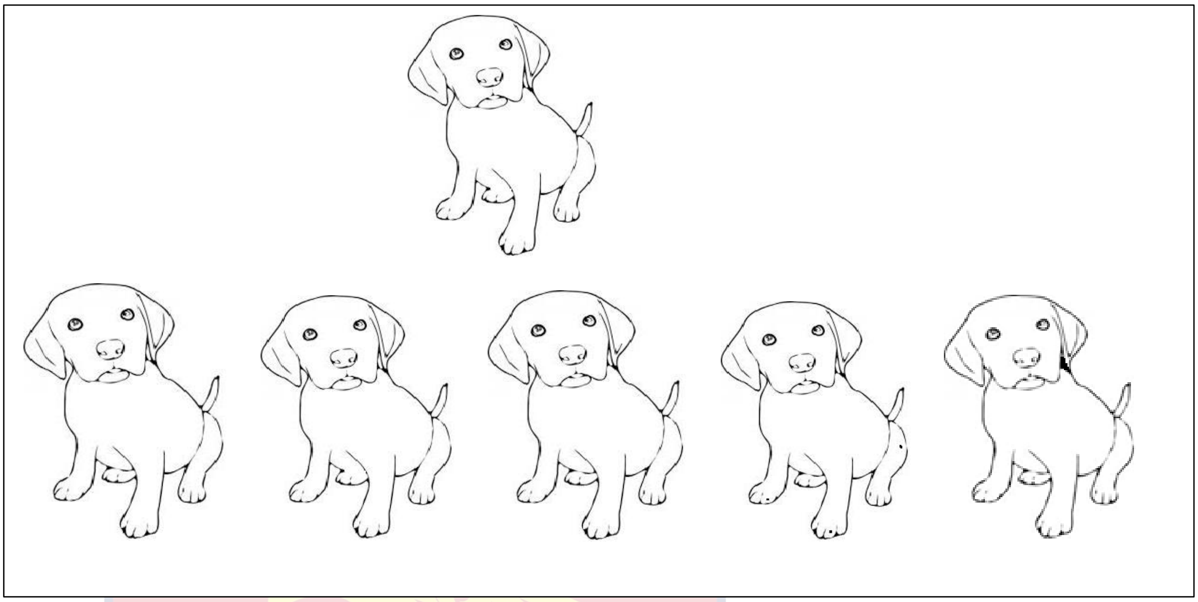
MFFT Time 1…………… Time 2………………….

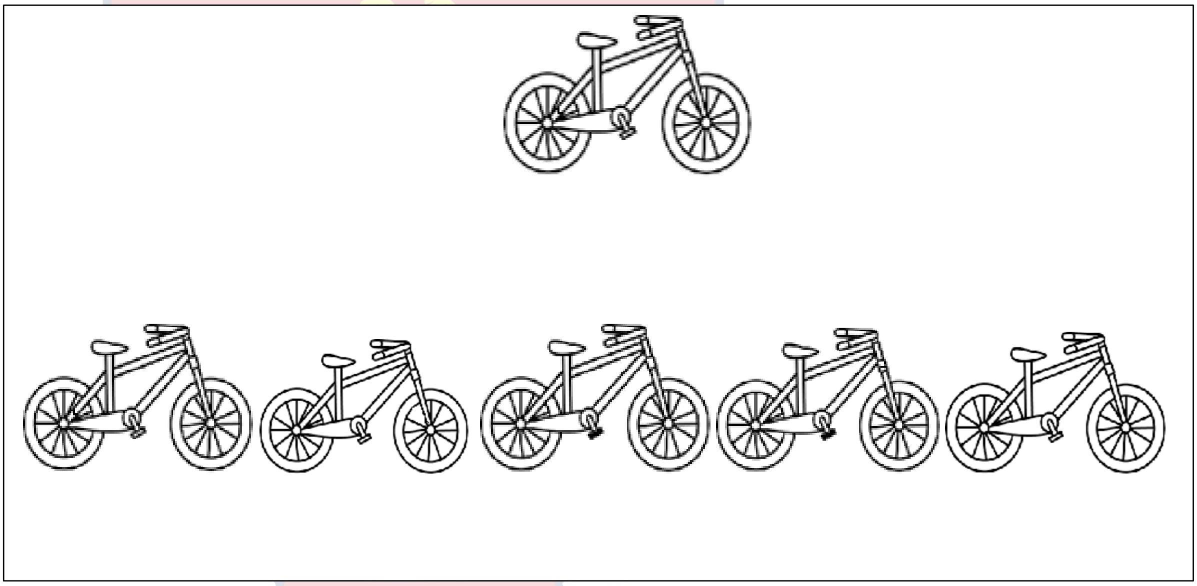
NAME: ______________________________________AGE________

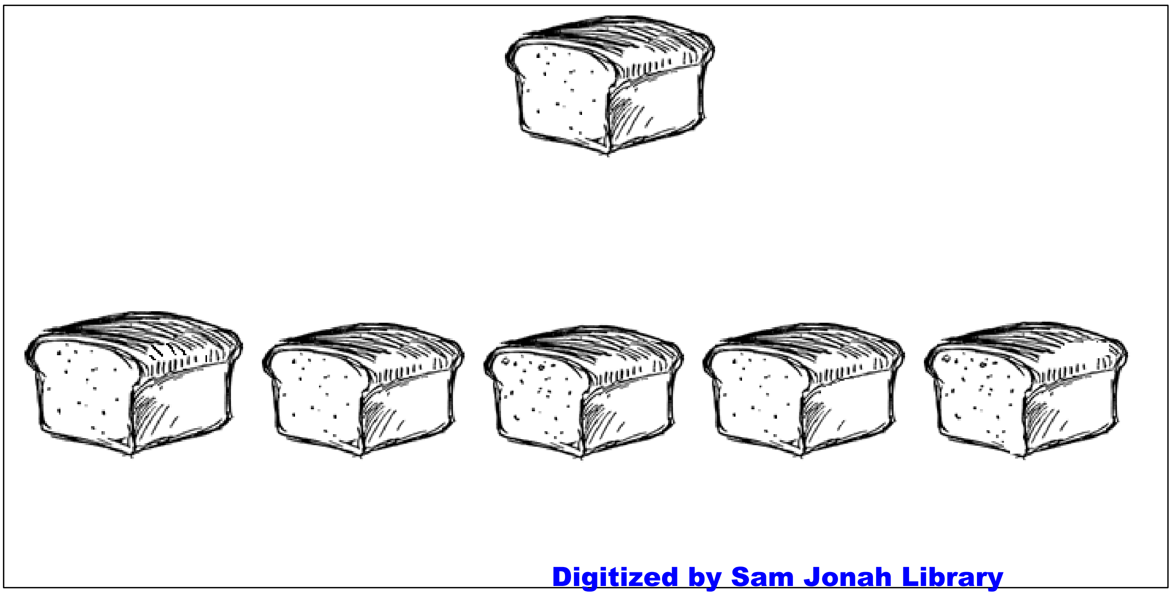
Instruction: The following pictures are things you see in school and at home. In each picture, you will find one on top and five others at the bottom. Draw a line to match the top one to the one that is exactly the same as it at the bottom.

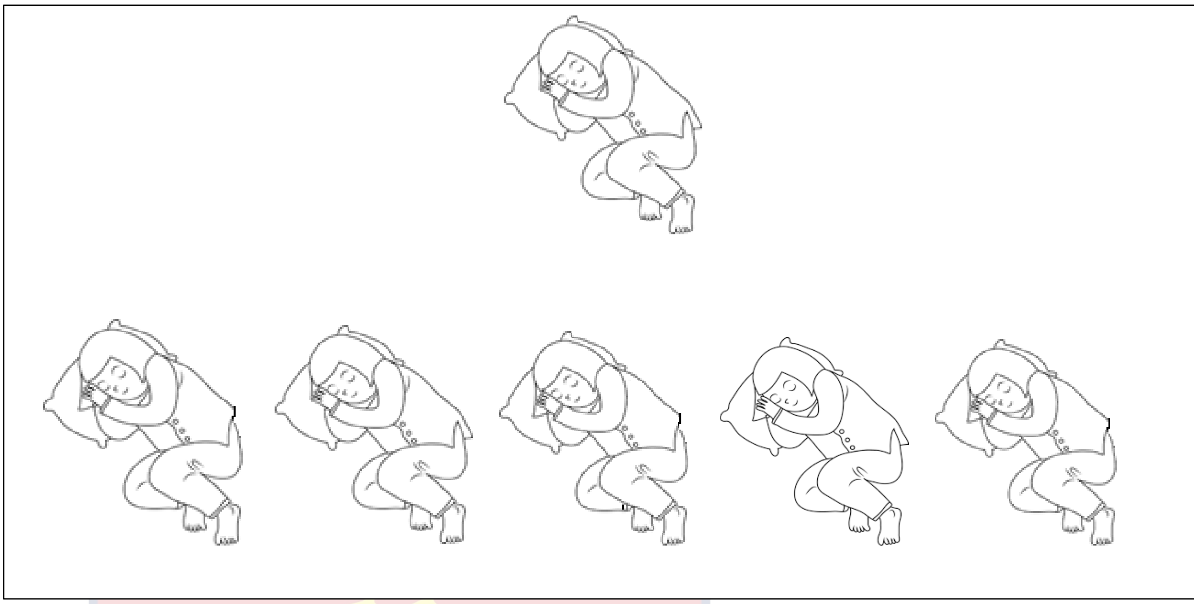


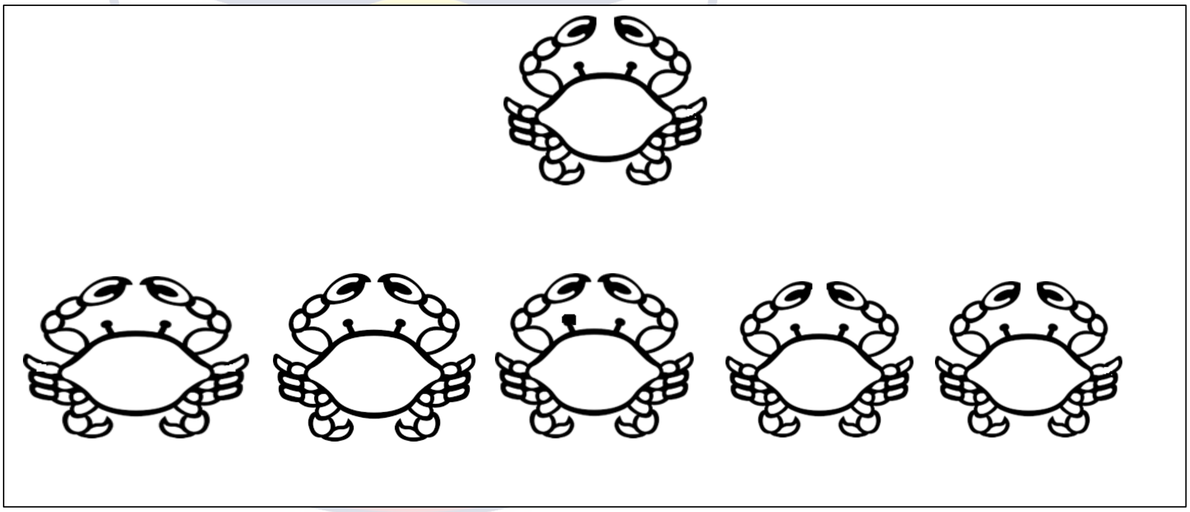












APPENDIX I

ACADEMIC PERFORMANCE TESTS

Academic Performance Test Basic 4 (Four)

ENGLISH LANGUAGE

Name: ____

School: ____

Age: ____________________________ Class: ____________________

Gender: Boy ( ) Girl ( )

Instruction: Read the passage carefully and answer the questions below it.

Selasie's mother goes to the market every morning. She carries a big tub on her head. She buys meat, soap, vegetables, batik fabric and many other things from the market. Selasie smiles and greets the shopkeepers and the old lady who sits at the roadside sewing clothes on her small sewing machine.

1. Where does Selasie's mother go every morning?
   (a) Beach (b) Market (c) Roadside
2. What does she carry?
   (a) a big tub (b) a big basket (c) a big bowl
3. Who sews clothes?
   (a) Selasie (b) Selasie's mother (c) The old lady
4. What does Selasie's mother buy at the market?
   (a) Meat, sugar and batik fabric
   (b) Meat, soap, vegetables and batik fabric
   (c) Soap, sugar and okro.

Use was/were to complete the past continuous tense.

5. Mother______________ shopping for vegetables.
6. Esi ______________ weeding the garden.
7. They ___________ walking to the market.
8. My friends ___________ dancing on the stage.
9. You ___________ washing the clothes.

Complete these sentences with the correct plural nouns.

10. The __________ are working in the garden.
    (a) man (b) men
11. The baby has two ______________ in her mouth.
    (a) tooth (b) teeth
12. Mrs. Ofori has three _____________.
    (a) knives (b) knifes
13. Adongo has six ___________.
    (a) children (b) child
14. The __________ are twenty in number.
    (a) bottle (b) bottles
15. My mother's ___________ are mine.
    (a) bag (b) bags

Academic Performance Test for Basic 4 (Four)

MATHEMATICS

Name: ____

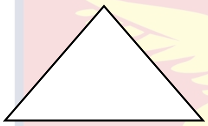
School: ____

Age: ______________________ Class: ________________

Gender: Boy ( ) Girl ( )

<u>Instruction</u>: Read the instructions carefully and answer the questions below it.

1. Identify this shape.



(a) Square (b) Triangle (c) Rectangle

2. Write the following number in expanded form 6881.

(a) 6000 + 800 + 80 + 1 (b) 600 + 80 + 8+ 6 (c) 6000 + 60 + 800 + 1

3. Subtract Th H T O

5 3 8 2

\- <u>1 2 6 7</u>

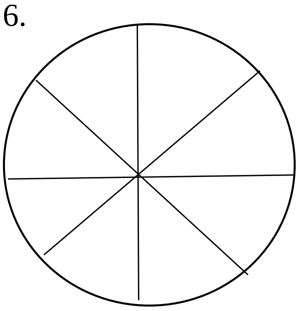
______

(a) 5114 (b) 4115 (c) 4511

5. What is the fraction of the shaded portion?

(a) $\frac{6}{6}$ (b) $\frac{2}{6}$ (c) $\frac{1}{6}$

6.



(a) $\frac{4}{8}$ (b) $\frac{6}{8}$ (c) $\frac{3}{8}$

7. What is the total weight 10kg + 27kg = ☐

(a) 36kg (b) 27kg (c) 37kg

8. Multiply vertically

T	O
2	3
x	4
___	___

(a) 92 (b) 29 (c) 39

Write true / false

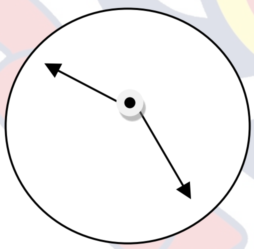
9. (3 x 4) = (6 x 2) ____________________

10. (4 x 8) > (2 x 8) ____________________

11. 15 toffees are divided equally among 3 girls. How may toffees will each girl get?

(a) 6 (b) 5 (c) 3

12. What is the time?



(a) 5:10 (b) 10:25 (c) 10:15

13. How many days make one year? (a) 375 (b) 365 (c) 355

Compare using >, < or =

14. 1952 ___________ 1962

15. 6879 ____________ 6789

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